

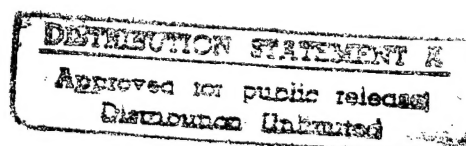
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5 MAY 1992



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# ***JPRS Report***

# **Environmental Issues**



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# Environmental Issues

JPRS-TEN-92-008

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## CITES Conference

### Southern African Countries Abandon Ivory Trade Bid

OW1003033892 Tokyo KYODO in English 0320 GMT  
10 Mar 92

[Text] Kyoto, March 10 (KYODO)—A group of four Southern African countries and South Africa on Tuesday withdrew proposals at the Convention on International Trade in Endangered Species (CITES) conference in Kyoto for a staged resumption in the ivory trade.

Following a 105-minute discussion of the proposal put by Botswana, Zimbabwe, Malawi, and Namibia, the chairman of a CITES conference committee interrupted debate to announce that 15 countries, including the United States, Tanzania, and Zambia, had spoken against the proposal and only one, Switzerland, had spoken in support.

He then responded to a request from Zimbabwe for a temporary suspension of the debate for the delegates of the four countries to consult.

After a seven-minute break, delegates resumed their seats and the delegate from Botswana, speaking on behalf of the four, announced they would withdraw their proposal.

The proposal put by the four would have imposed a limited moratorium on the ivory trade until all four had antipoaching measures in place sufficient to satisfy other CITES member countries.

Exceptions to the moratorium would have been trade to countries which do not permit the reexport of ivory products, and the sale of ivory within the four countries to meet the demands of the tourist industry.

The Southern African elephant currently has an Appendix I listing under CITES regulations which automatically ensures that the species and its products are banned from international trade.

Under the withdrawn proposal, the four had sought to have the African elephant down-listed to Appendix II to permit controlled trade.

A similar proposal put by South Africa was also withdrawn after a brief debate.

Several African countries complained during the debate that South Africa was one of the main outlets for ivory poached in their countries.

Opposition to the proposals appeared to come from countries which argued that any limited resumption of the ivory trade would be a signal to poachers to again enter the market.

### Sweden Withdraws Bluefin Tuna Ban Proposal

OW1003115292 Tokyo KYODO in English 1127 GMT  
10 Mar 92

[Text] Kyoto, March 10 (KYODO)—Sweden withdrew Tuesday its proposal for restrictions on trade in Western Atlantic bluefin tuna at the Convention on International Trade in Endangered Species (CITES) conference.

The withdrawal followed a compromise on the issue between Sweden and Japan following days of high-level contact between the two countries' delegations at the March 2-13 CITES meet, conference sources said.

The Swedish proposal was opposed by a group of tuna fishing countries which included the United States, Japan, Canada, and Morocco.

A Swedish representative said at the afternoon session that the numbers of bluefin tuna have been decreasing but that Sweden is ready to withdraw its ban proposal on condition the International Commission for the Conservation of Atlantic Tunas (ICCAT) continues to survey and monitor fishing quotas.

He also called for nations not belonging to ICCAT to cooperate in reducing bluefin tuna fishing in the region.

Delegates from tuna fishing nations agreed with the conditions and expressed appreciation on Sweden's presentation of the bluefin tuna issue.

Sweden then formally withdrew the ban proposal.

At a joint press conference, Yuji Kumamaru, director of the Social Cooperation Division of the Foreign Ministry's United Nations Bureau, said Japan had spoken to many countries and was satisfied it had discussed the biological aspects of the issue with Sweden.

Swedish delegation leader Sven Johansson said at the press meeting it achieved its original aim of having the issue aired.

But Johansson said he regretted the debate had not dealt with the biological issues involved.

### Frog Leg Exports Gain Reprieve

OW1103043992 Tokyo KYODO in English 0430 GMT  
11 Mar 92

[Text] Kyoto, March 11 KYODO—Gourmet diners with a taste for frog legs gained a reprieve from possible restricted exports from the Asian region Wednesday.

The reprieve came during the eighth working day of the conference of member countries of the Convention on International Trade in Endangered Species (CITES) when a German delegate withdrew a proposal for stricter export controls over 42 species of Asian bullfrogs.

Indonesia is the main exporter of processed Asian bullfrogs, but India and Bangladesh also participate in the trade.

The species are also popular at markets throughout the South and Southeast Asian region.

The major importing countries are Belgium, France and the Netherlands.

A scientific study of the usage of the Asian bullfrog prepared for the CITES Secretariat said Indonesia now supplies 75 percent of the frozen frog legs exported to the European Community and 73 percent of exports to the United States.

The study estimated that in 1987, 60-82 million frogs were killed in Indonesia to satisfy the local and international markets, while "perhaps as high as 50 percent" of this total was "wastage" considered to be of insufficient quality for export.

The report also said that because of difficulties in identifying differences between protected frog species

and those not protected, it is possible that an illegal trade in Asian bullfrogs is occurring.

But the German proposal met immediate opposition from several Asian countries at the CITES conference.

A Chinese delegate to the conference said China was not satisfied there is sufficient data to justify a CITES listing of the frogs on its Appendix II, a move which would require the application of export permits from countries of origin.

The head of the Indonesian delegation, Sutisna Wartaputra, told delegates that a recent increase in frog exports from his country has its origins in agricultural change.

Wartaputra said the frog population in his country had undergone a rapid increase in recent years as a result of an increase in the area devoted to rice paddies.

Germany then withdrew its proposal.

## REGIONAL AFFAIRS

### Drought May Cut Cereal Output in Southern Africa

*MB1003195292 Johannesburg Radio RSA in English  
1500 GMT 10 Mar 92*

[Text] An agency of the United Nations has warned that drought in southern Africa is likely to cut cereal output by 25 percent this year and could lead to widespread famine. The United Nations Food and Agriculture Organization [FAO] said the region would need to import more than 6 million tonnes of cereal in 1992 compared with only 2 million tonnes in a normal year.

The FAO said hot and dry conditions in January, and the first half of last month severely affected crops throughout southern Africa, and cereal output was not expected to be more than 16 million tonnes. It warned that with international attention focused on the poor food situation in the Horn of Africa, and the former Soviet Union, it can prove difficult to mobilize international assistance for southern Africa.

## GHANA

### Government Sets Environmental Impact Assessment Policy

*92WN0315B Accra PEOPLE'S DAILY GRAPHIC  
in English 19 Dec 91 pp 1, 8-9*

[Article by Siisi Quainoo: "Environmental Impact Certification Policy Now in Full Force"]

[Excerpt] The government has adopted Environmental Impact Certification Policy to ensure sustainable development.

The policy was necessitated by the recognition that the environment and development are supporters and interdependent.

Mr. Kwamena Ahwoi, Secretary for Local Government, who said this at the Expo '91 at the Trade Fair Centre, La in Accra yesterday, pointed out that to achieve the objectives of the policy, the government has established mechanisms which would ensure that the resources of the country are exploited for present use without compromising the demand for the future generation.

Mr. Ahwoi said under the new policy, all new development activities in the country have to consider the environmental components and developers are now requested to undertake Environmental Impact Assessment of their projects before approval can be granted.

He said since the policy came into effect nine new mining companies have complied with the government directives on the preparation and submission of the Environmental Impact Assessment report.

These reports, he said, have been reviewed and provisional approval granted to all of them subject to the implementation of certain commitments in their reports before final certificates are issued.

He said some of the mining companies have adopted water management policies where the management is to provide suitable alternative water supply where mining operations contribute to the deterioration in drinking water quality and quantity.

Mr. Ahwoi further announced that some mining companies have also established units to be responsible for environmental issues.

He, however, expressed regret that some existing industrial establishments which were requested to submit their environmental management plans to the Environmental Protection Council (EPC) have not responded favourably.

He called on those who have not yet done so to get in touch with the EPC for necessary assistance in the preparation of their plans. [passages omitted]

### 10-Year Environmental Action Plan Issued

*92WN0315A Accra PEOPLE'S DAILY GRAPHIC  
in English 16 Jan 92 pp 1, 8-9*

[Article by Adwoa Van-Ess: "Ghana's Environmental Action Plan Ready"]

[Text] A 10-year Environmental Action Plan (EAP) covering 1991-2000 is now out. It defines a set of policy actions, related investments and institutional strengthening activities to make Ghana's development strategy more environmentally sustainable.

An executive summary of the document made available to the **Graphic** indicates that it is the result of major efforts made by the PNDC [Provisional National Defense Council] since 1988 to put environmental issues on the priority agenda was prepared by a number of sector committees under the co-ordination of the Environmental Protection Council (EPC).

The exercise culminated in the preparation of a strategy to address the key issues relating to the protection of the environment and better management of renewable resources.

The EAP demands that a national environmental policy be adopted to provide the broad framework for the implementation on the action plan to ensuring sound management of resources and the environment and to avoid any exploitation of these resources in a manner that might cause irreparable damage to the environment.

In pursuance of the main objective, the policy provides for the maintenance of ecosystems and ecological processes essential for the functioning of the biosphere and the protection of human beings, animals, plants and their habitats.

Furthermore, it provides for guidance for healthy environmental practices in the national development effort, integration of environmental considerations in sectoral structural and socio-economic planning at all levels and common approach to regional and global environmental issues.

It also provides for appropriate incentives and sanctions to be put in place to ensure compliance with the provisions of the policy.

The EAP covers land management, forestry and wildlife, water management marine and coastal ecosystems.

Others are industrial pollution, mining, hazardous chemicals and human settlements.

The EAP also provides that the government undertakes certain policy actions that may be deemed necessary under the above mentioned areas.

Under land management, the government is to establish a body to be responsible for policy, planning, coordination and monitoring of land based development programmes and projects in Ghana among others.

On forestry and wildlife, the government is to adopt revised conservation laws and regulations among others while new guidelines are to be formulated for the extraction of water for different uses, integrated planning for river basins and the control of waste discharge into water bodies to ensure efficiency water management.

The EAP also enjoins the government to establish protection areas in coastal wet lands among others under marine and coastal ecosystems while under human settlement, government is to adopt human settlements law to provide a general framework for planning and managing settlements.

On pollution control, the government must among others adopt legislation to control the import and use of pesticides and other hazardous chemicals.

Meanwhile, the necessary policy instruments and structures will be put in place during the first two years. A variety of individual projects will also be implemented by various national agencies.

## KENYA

### Mass Lake Nakuru Fish Deaths Attributed to Pollution

92WN0316A Nairobi THE KENYA TIMES in English  
31 Jan 92 p 3

[Article: "Mass Fish Deaths in Lake Explained"]

[Text] A study conducted by experts on the waters of Lake Nakuru following the mysterious mass deaths of about eight million tilapia fish in July last year has

revealed that they were caused by high Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) in the lake.

Samples of water taken from various sections of the lake were found to have 210 milligrammes of COD, while BOD stood at 70 milligramms per every litre of water.

These are comparatively lethal concentrations as the normal level is supposed to stand at 30 and 20 milligrammes per litre respectively.

The Nakuru District Environmental Officer, Mr. Allan Kamau, said in Nakuru on Wednesday that likewise, a high metal concentration was detected in the lake, an occurrence that is also dangerous to marine life.

Mr. Kamau was briefing Mr. Edward Rothschild and Sons Limited, London, and Stephen Skill, the General Manager of Biotechna of England, who was currently in Kenya to study the country's sewage system and seek possible ways of modernising it to reduce its pollution effect on the environment.

The environmental officers blamed the high concentrations of the substances on the inability of the old Nakuru municipality sewage plant to break down what it receives thoroughly before discharging the same into the lake.

The two officials who had earlier visited Kisumu municipality said the World Bank was ready to give a grant of Sh1 billion dollars to Kenya for the improvement of sewage systems in its municipalities to curb pollution.

Also present was the Nakuru municipality Director of Social Services, Mr. J.M. Michoma.

## MOZAMBIQUE

### Tete Province Declares State of Emergency Due to Drought

MB1703202992 Maputo Radio Maputo in English  
1800 GMT 17 Mar 92

[Text] The local authorities in the northwestern Mozambican Province of Tete have declared a state of emergency because of the drought that has devastated agriculture in the region, according to today's issue of the daily paper, NOTICIAS. Tete is the second province to declare an emergency. The first was Gaza in the south of the country.

Last year, 80,000 people, mostly displaced by the war waged by Renamo [Mozambique National Resistance] rebels, received free food aid in the province. This year it is feared that the drought will push this number to 200,000. Farmers were not optimistic when no rain at fell in January and February which are normally the wettest months of the year. Rivers and streams were dried up, and even the level of the mighty Zambezi River has fallen significantly.



The paper reports that livestock are dying because of lack of water and of pastures. Their owners are busy slaughtering and selling their animals rather than watch them die of starvation.

As a food security measure, the Tete provincial government has issued an order forbidding any exports of maize to other parts of the country.

## NAMIBIA

### Seminar Examines Deforestation Problems

92WN0343A Windhoek *THE NAMIBIAN* in English  
31 Jan 92 pp 1, 3

[Article by Kate Burling]

[Text] "Unprecedented deforestation" is steering Namibia towards an environmental catastrophe, with 93 percent of the country's wood products being used to make fires.

Reviewing the progress of this week's one-day forestry research seminar, Director of Forestry Ben Siyambango warned that "problems are certainly coming for Namibia."

The decision to establish a new forestry research centre in the old railway nursery at Okahandja was part of the seminar's plan of immediate action to stop the downward spiral. "We don't have any time to waste on this issue," Siyambango warned.

Though a good start in forestry research was made during the days of German colonialism, the work was apparently abandoned under the South African regime, which saw forestry as little more than an off-shoot of agriculture, said Siyambango.

"They also had a well developed and competitive forestry industry and saw Namibia as a market for their own products, so not much work on the subject was done here," he added.

Ironically enough, the presence of the SADF [South African Defense Force] in Namibia during the war played a part in conserving the country's dwindling wood stocks. Since certain military-controlled areas were no-go to local residents, the trees enjoyed a fairly long period of protection.

"But since independence, with free access to all areas, it has been impossible to check the rate of deforestation," Siyambango explained.

He said most people saw wood as a straightforward source of income, without realising its limited supply.

The clearest cases of deforestation are happening in the north where the last of Namibia's forests are situated. According to Siyambango, the greatest number of trees

could be found in the forests of the Kavango, Bushmanland and eastern Owambo, while Caprivi's forests held the best quality wood.

However, with 93 percent of wood biomass being used for fuel and the rest being used for building materials, Siyambango said Namibia was consuming trees at a far faster rate than it was growing them.

Other resolutions taken by the conference, which drew forestry scientists, farmers, NGOs and Government representatives from all over the country, were also concerned with the promotion of research.

"It's no good embarking on an afforestation programme until we have established certain basic facts, such as the type of trees we should plant," said Siyambango.

Some initial research had already been done in newly set-up nurseries around the country, but the more comprehensive Okahandja research centre would hopefully be operational by the end of March, said Siyambango.

### Government Asks for Drought Relief From EC Vice President

MB1603195292 Johannesburg *SAPA* in English  
1852 GMT 16 Mar 92

[By Carmen Honey]

[Text] Windhoek Mar 16 (SAPA)—Namibia has asked the European Community for about R[and]192 million—52 million European Currency Units [ECU]—in relief aid to counter effects of the severe drought facing the country, says EC Vice-President Manuel Marin.

He told a Monday news briefing at State House in Windhoek that a proposal was certain to be put to the European Parliament's Council of Ministers requesting a special southern African drought relief programme similar to the 300 million ECU designed for sub-Saharan Africa last year.

"I am afraid if the effects of the drought are so dramatic we need to establish more or less the same programme," Mr. Marin said.

Namibia's request would be added to those already submitted by Angola, Mozambique, Zambia and Zimbabwe.

Mr. Marin said it was possible for the EC to provide food aid "immediately if necessary" as this was a decision able to be taken by the vice-president.

On Monday Namibian President Sam Nujoma and Mr. Marin signed the National Indicative Programme for Namibia under the Fourth Lome Convention making available about R168 million—45 million ECU—in grants for development assistance.

Finance Minister Dr. Otto Herrigel and the director for Africa in the European Investment Bank, Mr. Thomas

Oursin, signed an agreement providing about R22 million or six million ECU to be made available through the bank in risk capital for private sector activities in agro-processing, manufacturing and transforming local natural resources.

This development assistance is separate from and in addition to a package of about R37 million or 10 million ECUs announced at the signing of a memorandum of agreement between Namibia and the EC on February 12.

Namibia acceded to the Fourth Lome Convention on December 19, 1990 and this was ratified in the National Assembly on October 10, 1991.

Mr. Marin paid tribute to the leadership and people of Namibia for their successful transition to independence.

"The principles of democratic self-government and respect for human rights which are an integral part of your constitution are considered essential principles by the European Community," Mr. Marin said, adding where applicable positive measures would be taken to support the democratisation process.

"You may be sure of the support of the European Community in the development of your new country, which has great significance not only in itself, but also in the regional context, as southern Africa moves towards a period of peace, and we trust, prosperity," he said.

Mr. Marin extended an invitation to President Nujoma, which he has accepted, to visit the EC's headquarters in Brussels, Belgium.

## NIGERIA

### Lagos State Protests Oil Industry Pollution

92WN0342A Lagos *THE GUARDIAN* in English  
11 Feb 92 pp 1, 2

[Article by Idowu Akinseye, Sonny Onu and Yinka Fabowale]

[Text] The government of Lagos State protested yesterday the pollution of its waters by the oil industry just as the Federal Environmental Protection Agency [FEPA] proposed measures to curb the menace of the industry to the environment.

Lagos State Governor Sir Michael Otedola said at an international seminar on petroleum industry and the Nigerian environment that it was disturbing that the state's fresh water resource was declining because of effluents from the industry.

The pollution, he said, is at an "alarming stage" since 17 percent of Lagos State's landscape of 3,577 km is water ways, now largely polluted by petroleum and related industries.

Already infested with oil discharge from barge washing during loading of oil tankers at terminals are the Lagos

lagoon, its inland drainage channels, canals, tertiary drains at Festac Town, Naval Dockyard, National Theatre, Iddo and Ijora areas.

Other sources of pollution are spillages, careless handling of oil at petrol stations, discharge of spent oil from industrial machines, electricity generating sets, large mechanical and roadside workshops and garages and oil discharges from intersector pits from the various petroleum depots in and around the state.

Sir Michael, represented by his deputy, Alhaja [word indistinct] Ojikutu, said it was ironical that Lagos itself was not an oil-producing state (yet), despite its exposure to the hazards of the oil industry.

"All these oil discharges find their ways into our surface and underground waters," the governor said, pointing out that the citizens "will face grave environmental problems and public health degradation if adequate control measures are not put in place."

Evidence of the hazards, according to the governor, include the fire outbreak of 1983 when some Lagos State ferries caught fire on the Festac canal because of oil spills from barges resulting in "loss and damage of its properties."

Besides complaining about the uselessness of the creeks and part of the lagoon which have become "dead waters" with their attendant foul odour, the governor advised against:

- the discharge of untreated, harmful industrial waste, sewage, disposal of both industrial and domestic refuse;
- the discharge of hazardous fumes and particular matters into the atmosphere by industries; and
- pollution arising from petroleum bye-products which results in covering up of the surfaces of "our water bodies in the state and preventing, depriving the plant/fish communities."

He would also want the establishment of an effective public enlightenment programme on spent oil discharges by affiliated petrol station's workshops and the surveillance of the NNPC Atlas core to prevent further oil spillages from boats and barges.

Feasibility studies on other clean-up and rejuvenating of affected bodies of water such as Lagos Lagoon, creeks and canals should also be undertaken.

FEPA promised yesterday to release "National Guidelines and Standards" for the industry. Its chief executive, Dr. Olu Evans Aina, gave an insight into the document, saying it would ban the dumping of drilling muds and cuttings in dryland and onshore area.



It will also stipulate provisions for cleaning the existing waste pit within specified deadline in accordance with the stipulations of the London Dumping Convention already ratified by Nigeria.

The policy, according to Dr. Aina, will also prescribe recycling of crank case and other waste oil.

While the global concern over pollution from the industry continues, Dr. Aina said Nigeria ought to adopt measures about its own environment to avert the suspected organised campaign to discredit the importance of oil to the environment.

Said he: "Our local actions and common concern are the most important against the now popular global environmental issues such as global warming, climate change, ozone layer depletion and loss by biodiversity."

He referred to a proposed meeting by the United Nations on Environment and Development (UNCED) to determine the hazard of petroleum for which the advanced countries have proposed carbon tax for oil-producing nations.

But Nigeria seems to have prepared its defence on the issue as Petroleum and Mineral Resources Minister Prof. Jibril Aminu may lead other Third World countries against the proposed legislation during the conference slated for Rio-de Janeiro, Brazil.

Articulating the views of the Third World oil-producing nations, Prof. Aminu, represented by group managing director Dr. Thomas John described the proposed tax as a sinister move to further marginalize oil and strangle economies of the poor nations.

Still battling with dwindling foreign earnings from oil, Nigeria, according to Prof. Aminu, opposed the proposed legislation because it was capable of suppressing global demand for oil as this would lead to a further price slide at the international market.

#### **Oil Companies Sponsor Environment Projects**

92WN0398A Lagos *FINANCIAL GUARDIAN*  
in English 24 Feb 92 p 2

[Article by Tajudeen Adigun and Ali Ocheni]

[Text] Two separate projects designed to protect communities located in the oil-producing areas of the country from the peril of oil spillage have now taken-off as concern over hazardous effect of oil and gas exploration and production activities assume worldwide dimension.

The schemes being sponsored by the 11 major oil prospecting companies in the country are:

—the environmental sensitivity index (ESI) mapping project phase I which will cost \$1.5 million in foreign input plus N1.8 million, in local currency; and

—a N60 million project meant to develop and maintain a reliable and efficient oil spill containment and recovery organisation over the next four years.

Petroleum industry sources explained that the ESI project is intended to provide comprehensive information about:

—relative sensitivity of the environment to spilled oil;

—biological and social economic resources that will be needing protection against spilled oil, and their locations;

—location of major human settlements and oil installations; and

—type of response strategies to be adopted in each oil producing communities in case of spillage.

The scheme, *FINANCIAL GUARDIAN* learnt, will involve the gathering and analysing of chemical, biological, meteorological and hydrographic data of various areas in the country where crude oil exploration and production activities are taking place.

The vice chairman of the oil producers trade group, Mr. Rene Bucaram of Texaco (overseas) Petroleum Company, explained that an ESI mapping committee has been instituted to implement the project.

Contract, it was gathered, has been awarded to a Kaduna-based company to handle the satellite imagery data acquisition from Paris, France for the production of the first comprehensive ESI maps for Nigeria.

*FINANCIAL GUARDIAN* learnt that the ESI phase I project which is being funded solely by Shell Petroleum Development Company, pending contribution from the other 10 companies, will cover the southern part of the country including the deep off-shore concessional areas.

Sources also said that the N60 million oil spill control and recovery contract has been awarded to an Anglo-American firm, Alba Nigeria Limited.

The company under the terms of the contract is to develop an equipment stockpile and response capability to combat any major oil spill in the country between now and 1995.

The equipment expected to be stockpiled, along with existing ones, at Warri, Port-Harcourt, Kaduna and Calabar operational bases are to be maintained in good shape and mobilised by the company to the site of any major oil spill.

Alba is expected to also restore, to normalcy the ecological system of any area affected by oil spill.

## SOUTH AFRICA

**Vanadium Plant Reportedly Poisoning Farmland**

92WN0324A Johannesburg THE WEEKLY MAIL  
in English 7-13 Feb 92 p 5

[Article by Jennifer Verster and Eddie Koch]

[Text] *A farmer claims that half his dairy herd has been poisoned by a vanadium factory in the eastern Transvaal—and there is serious concern about the health of residents in the area.*

Lawyers for Transvaal Alloy [TA] yesterday said the Onderstepoort report "is tentative and is based on circumstantial evidence. A survey by independent experts has not revealed anything to indicate that TA has contributed to Mr. Geldenhuys' problems in any way."

According to TA: "The plant has been upgraded continuously in order to modernise the equipment and ensure that the company complies with the obligations in terms of the Atmospheric Pollution Prevention Act. The company holds a registration certificate issued in terms of this Act."

"Monthly, gravimetric monitoring, in line with Act 70 of 1973 as amended, of the plant environs is done by an authority accredited by the Department of Mineral and Energy Affairs—Air Quality Division. This monitoring reveals that the company is in compliance with the required standards."

"The company is aware of no conclusive evidence that its operations have caused any damage to Mr. Geldenhuys."

"The company indicated that if Mr. Geldenhuys persisted in his claims to the contrary it would be necessary to arrange for certain sampling to be undertaken on his property. Mr. Geldenhuys has refused to give the company access to his property."

"During 1975, an earlier owner of the property, a Mr. Jacobs, brought a claim in the supreme court against the company for damages... Expert evidence obtained by the company indicated that the problem experienced by Mr. Jacobs arose from poor agricultural practices rather than from contamination or pollution from the company."

Farmers in the eastern Transvaal are up in arms about toxic fallout from a German-owned vanadium plant that they say is linked to a disease which kills cattle and causes cows to abort prematurely.

And the health of people living near the factory, in the upper Steelpoort Valley 40 km north of Middelburg, may be at risk. A farmer whose land borders the chemical plant claims his lungs have been made "rotten" by the pollution, while preliminary studies conducted by the Medical Research Council indicate that one in two people in the district suffer from eye irritation.

The department of health—responsible for monitoring pollution emanating from the Transvaal Alloys factory, owned by the German multi-national Norddeutsche Affinerie—appears to be dragging its feet over addressing the problem.

"Your factory poisons 30 km and further the environment around you," said farmer Piet Geldenhuys in a letter to the company. "*in die natuur vrek al wat leef om u fabriek* (everything that lives around your factory dies): fish, birds, animals and a large number of plants and the people are being drastically affected."

The plant refines vanadium ore to produce vanadium pentoxide and ammonium metavanadate. These appear to be strategic compounds used in the armaments and nuclear industries as well as the manufacture of synthetic fuels. G.R. Hvener, general manager of Transvaal Alloys, refused to tell THE WEEKLY MAIL who the company's clients were.

Hvener has denied any responsibility for degrading the environment around the plant. He is backed by the government's chief air pollution officer, Martin Lloyd, who says "the dust on the windowsill in my office carries more toxins than the air in the eastern Transvaal."

But this has not deterred Geldenhuys from conducting a campaign against the multi-national. And the farmer has received backing from a team of scientists based at Onderstepoort near Pretoria—toxicology researchers began investigations after they received reports some 18 months ago of a strange disease afflicting cattle in the area.

Two-year-old bull calves on the farm seem to have stopped growing at six months. But they are the lucky survivors: in the past five years, Geldenhuys claims to have lost 50 percent of his dairy herd.

A local vet identified the disease as "illthrift"—a chronic disease that suppresses the immune system of livestock, disrupts the animal's ability to digest food and impairs fertility. It appears to be caused by long-term exposure to toxins.

[Words omitted] lying cause of the illthrift problem experienced on the farm.

"On the basis of all our findings, and until proved otherwise, we conclude that there is sufficient circumstantial evidence to make a diagnosis of vanadium toxicity which was most probably caused by air pollution which most probably came from the nearby mine (processing plant)."

After months of research and post mortems on cattle and stillborn calves, together with grass and soil samples, the research team concluded that the cattle were suffering from malabsorption complicated by immunosuppression and that the most likely cause was vanadium poisoning.

"There is now considerable evidence to suggest that the animals on the farm have an impairment of their immune system. This then makes animals susceptible to a wide range of infections that would otherwise not cause problems," says the report.

Studies into the effects of exposure to vanadium toxins on humans are less conclusive. A team of medical researchers headed by Dr. Petro Terblanche, of the Medical Research Council in Pretoria, has begun probing the issue.

"Fifty percent of the people living in the area complained of eye irritation," she told THE WEEKLY MAIL. "That is consistent with vanadium poisoning, but it needs to be verified."

Vanadium can cause respiratory problems, irreversible decline in lung function, reproductive complications, lower respiratory tract infections, skin rashes, gastrointestinal disturbances and lethargy.

Exposure to vanadium dust over about 15 to 20 years can lead to dust pneumonitis, which in turn leads to emphysema and high blood pressure. It can also lead to mild renal tubular damage.

There is concern among the people living in the area about the effect pollution may be having on their health. Children suffer from chest ailments and asthma and there seems to be a high incidence of kidney problems. Geldenhuys says local workers will not live on the farm because there is a higher incidence of women miscarrying.

M. Wide, conducting a study for the international journal ENVIRONMENTAL RESEARCH in 1984, found an increased frequency in spontaneous abortions in Finnish women that correlated to metal industries where aluminium, cobalt, molybdenum and vanadium were used. She also found experimental evidence that a single dose of vanadium could interfere with foetal skeletal ossification in pregnant mice.

Vanadium is used for its tactile qualities to strengthen steel. South Africa has half the world's reserves and is the single biggest producer of vanadium products. Ammonium metavanadate is also used in the manufacture of dyes, inks and paints, and vanadium pentoxide in the manufacture of ceramics.

At the factory, vanadium ore from a nearby mine is milled, the dust is mixed with water and sodium sulphate and made into pellets. These pellets are dried and roasted in a rotary kiln at temperatures of 1,220 to 1,300 degrees Celsius. Smoke and gases from the kiln escape through chimneys. Pollution is possibly from two sources: vanadium dust from the crushing process or compound smoke and gases emitted from the kiln.

"Work done by the CSIR (Council for Scientific and Industrial Research) has shown that there is considerable fallout of vanadium dust near the mine (4,710 micrograms a metre a day) and that these levels decrease

further from the mine (processing plant) (536 micrograms a metre a day), which supports our own findings that aerial pollution of the farm is taking place and gives added evidence that inhalation toxicity could be playing a role," says the Onderstepoort report.

This is not the first case of vanadium toxicity to be reported in South Africa.

In 1976 a case was brought to the attention of the then minister of agriculture, Hendrik Schoeman, by a Mr. Jacobs of the farm Leeuwklip in the Belfast district. This was the same farm that Geldenhuys now owns.

Geldenhuys bought the farm in 1986. Now facing bankruptcy because of his losses, he explained his problem to the Land Bank in Middelburg and was advised by the bank manager "to sell the farm as quickly as possible."

TA is adamant that it is complying with all standards and requirements set by the government (see accompanying article). Department of Health officials were unavailable for comment.

#### **Comprehensive Plan for Cape Coast Conservation Announced**

92WN0356B Cape Town THE ARGUS in English  
10 Feb 92 p 6

[Text] A comprehensive plan for the preservation of the Cape coast has been announced by the Cape Department of Nature Conservation.

"It is vitally important that the coast be managed as a whole, so that cohesiveness exists," said the chairman of the Coastal and Marine committee for the Council for the Environment, Dr. Allan Heydorn.

"The main aim is to encourage development along the coast in the right places and in the right manner—and not to destroy nature in the process."

Dr. Heydorn said that in the past natural coastal land had been spoilt by uncoordinated development.

Various categories for coastal uses have been included in the plan.

These include nature reserves with formal conservation status, conservation areas where no further development is to take place and conservation areas where controlled development will take place.

The Council for the Environment formulated the principles, objectives and guidelines for the plan.

"This plan is representative of all affected parties, because members of local governments and interested parties took decisions together," said Dr. Heydorn.

A spokesman for the Chief Directorate of Nature Conservation said there had been a sharp increase in pressure on coastal areas during the past year as a result of development.

He said the coastal areas accounted for 80 percent of development applications in 1990.

### **Portable Radiation Spectrometer for Mines Developed**

*MB1003190592 Johannesburg South African Broadcasting Corporation Network in English 1100 GMT 10 Mar 92*

[Text] The mining industry has designed an instrument for checking the exposure of mine workers to radiation which can cause lung cancer. The Chamber of Mines says in a statement issued in Johannesburg that the portable spectrometer was developed by its research organization, Comro [Chamber of Mines Research Organization]. The chamber said the instrument would enable mines to comply with new environmental legislation dealing with mine radiation.

## **SWAZILAND**

### **Food Aid Urgently Required as Drought Affects 250,000**

*MB1303185992 Mbabane Radio Swaziland Network in English 1600 GMT 13 Mar 92*

[Text] About quarter of the Swaziland population requires outside assistance as a result of the current hot and dry weather conditions.

A statement released by the minister of agriculture and the World Food Program said an estimated 250,000 people are seriously affected by the drought, and will require outside assistance of 40,000 tonnes of corn, and 3,600 tonnes of beans. The statement said groups requiring assistance are mainly subsistence level farmers and their families who have little cash or other resources which they can use to purchase food.

The minister of agriculture and the World Food Program have been visiting all areas of the country since mid-December in efforts to assess the extent of the drought which has been continually worsening. The assessment reflects the current situation, but if conditions deteriorate even further, the government will make an additional request for assistance. The statement urged people to completely refrain from the indiscriminate burning of grass.

## **ZAMBIA**

### **Nitrogen Chemicals Company To Boost Environmental Program**

*92WN0314C Lusaka TIMES OF ZAMBIA in English 21 Dec 91 p 2*

[Article: "NCZ To Tackle Pollution"]

[Text] Nitrogen Chemicals of Zambia (NCZ) is to spend \$4.7 million to boost its environmental programme.

According to the latest issue of NCZ *Image* magazine \$1.7 million would be used to reduce atmospheric pollution while \$2.5 million would go to the treatment of liquid effluent.

In a paper presented by NCZ general manager Imasiku Liayo on the industry's view on issues of environmental pollution and protection recently called on the environmental council to speed up the processing of licence applications for undertakings likely to discharge effluents to avoid a slump in industrialisation.

Mr. Liayo was speaking to the southern region Round Table discussion on the development of institutional coordination for management of degradation activities in the Kafue basin.

He said that a delay in processing licence applications would lead to cost over-runs in products management, withdrawal of funds by investors and a slow down in industrialisation.

### **Environment Minister Reviews Pollution Problems**

*92WN0314D Lusaka TIMES OF ZAMBIA in English 3 Jan 92 p 1*

[Unattributed report]

[Text] A mysterious water-borne disease has broken out at Itzhi-Tezhi in Southern Province killing cattle and fish and scorching vegetation along the heavily polluted Kafue river.

Minister of Environment Mr. Keli Walubita said in Lusaka yesterday he had sent a natural resources pathologist to the area to assess the ecological disaster and to establish the nature of the disease.

He said the Itzhi-Tezhi dam was littered with floating dead fish. Villagers had lodged a complaint to the Government on increased animal deaths.

Cattle, fish and other water creatures had been dying in large numbers since mid-December.

Mr. Walubita said the information he had gathered so far indicated the dam whose water was contaminated with dangerous waste from mines and industries on the Copperbelt had become a health hazard.

According to experts, there was a concentration of waste disposals in the dam as the water was not flowing quickly in the reservoir.

The ministry was anxiously awaiting a report on the environmental degradation which was threatening human life in Namwala.

Mr. Walubita noted that the Kafue was the most heavily polluted river in Zambia and possibly in the entire sub-region.

The ministry would by next week start enforcing the Environmental Protection and Pollution Control Act 1990 to ensure proper disposal of industrial wastes.

Companies which breach the Act would be penalised.

The ministry had received reports on environmental hazards on the Zambezi river around Chiawa, Gwembe and Sinazongwe where big agro-schemes such as Massstock were situated.

The president of ecology and environment centre in the United States has been invited by the Government to come and provide expertise.

The pollution of the air on Cairo Road in Lusaka caused by grain mills emitted in the sky was being checked following the ministry's intervention.

The broken seals on the conveyor were being repaired so the chunks were trapped.

Nitrogen Chemicals of Zambia, Kafue Textiles, Bata Tannery and Lee Yeast in Kafue were wrongly sited as they discharged chemical waste into Kafue river at points only a few km from where Lusaka drew its drinking water, the minister said.

And Mr. Walubita disturbed by the report on illegal dumping of garbage at Lusaka's Kabanana site-and-service by the Lusaka city council has directed that the litter be buried immediately.

The minister visited the dump on Tuesday when he learnt of it from the Press and condemned the practice by the council.

Mr. Walubita said yesterday that he was accompanied by senior council officials who assured him corrective measures would be taken.

The council was dumping garbage collected from nearly all parts of the capital at a residential area causing serious environmental degradation.

Mr. Walubita said he would check the spot to ensure that something was done but the Minister of Local Government and Housing Mr. Michael Sata had taken charge and promised to act.

But the problem of water in the area has persisted as the taps ran dry two weeks ago.

Residents draw water from a river contaminated with dirt which spews from the garbage dump.

MMD [Multiparty Democracy] branch chairman at Kabanana site and service Mr. Bernard Kangwa complained to the Times yesterday that the situation had worsened.

He wondered how Roma township which was situated on a higher plain did not run out of water when Kabanana which was down the slope had no water.

### Pollution Control Act To Go Into Effect

92WN0314B Lusaka TIMES OF ZAMBIA in English  
19 Jan 92 p 1

[Unattributed report: "Pollution Act Coming"]

[Text] The long awaited environmental and pollution control Act of 1990 comes into effect in March and offenders will pay finds of up to K500,000 besides varying sentences.

Minister of Environment Mr. Keli Walubita said: "The Act which was not fully effected under the UNIP government because of the lack of a specific ministry to monitor its implementation, had now found purpose under the newly created Ministry of Environment".

Although the Act would be implemented, there was still need to instill certain statutory instruments to give it more clout. "My minister is going to work flat out like the police force to ensure that regulations are complied to".

Mr. Walubita lamented at the extent of pollution in some rivers and singled out Kafubu and Maramba rivers in Ndola and Livingstone respectively as the worst in Zambia.

He intended to visit the affected towns and discuss pollution problems with councils to find a lasting solution.

It has been necessary to work out additional tightening clauses to the existing Act, "because the story today in the world is not on the political, social and economic front, but on the environment".

He said reading through a copy of the Act—it appears, the architects had their priorities elsewhere given the fact that in Zambia the air and water were the most affected by various pollutants.

Under the Act, pollution of the rivers and the atmosphere carry on specific penalties but are covered under a general clause which states that:

"A person who polluted the environment or contravenes any provision of this Act for which no penalty is provided shall be guilty of an offence and liable upon conviction to a fine not exceeding K100,000 or to imprisonment for a term not exceeding three years or both".

The Act is more severe on radiation and pesticides and toxic substances, with penalties of K500,000 and K200,000 with imprisonment periods of five and seven years respectively.



**Government To Take Measures Against Copper Company for Pollution***92WN0314A Lusaka TIMES OF ZAMBIA in English  
20 Jan 92 p 2*

[Article: "Pollution Move Cheers Residents"]

[Text] Kitwe residents who are planning to sue ZCCM [Zambia Consolidated Copper Mines] over its toxic sulphur dioxide have welcomed Government's decision to effect the Pollution Control Act of 1990 saying enough is enough.

A spokesman for the group said yesterday that air pollution by ZCCM in Kitwe and other mining towns had been left unchecked for many years by the fallen UNIP [United National Independence Party] government for some unknown reasons.

In Kitwe, the air pollution, sulphur dioxide is reported to have been causing eye irritations, coughing, chest tightness and many other ailments.

"It is nice to learn that firms polluting our environment such as ZCCM are now liable to fines of K500,000 with imprisonment periods of up to seven years. Many companies will not sit up to avoid these penalties," he said.

Minister of Environment Mr. Kelli Walubita announced at the weekend the Pollution Control Act of 1990 which was not effected by the UNIP government would be enforced in March and more instruments would be introduced to give it more clout.

"My ministry is going to work flat out like the police force to ensure that regulations are complied with," Mr. Walubita said.

But the spokesman appealed to Mr. Walubita to visit Kitwe and other mining towns to see for himself the amount of air pollution by ZCCM.

"The minister should come to Kitwe and have a 'taste' of our 'senta' (sulphur dioxide) those asthmatic patients near our smelter are in a worse position and ZCCM is reported to be dishing out milk to them but this is not a solution," the spokesman said.

The Act is more severe on radiation, pesticides and toxic substances with penalties of K500,000 with imprisonment periods of five and seven years respectively.

ZCCM said plans were underway to set up a sulphuric making plant at its Kitwe smelter to take care of some of the sulphur dioxide but made it clear that even with acid production, the 'senta' problem would still be there.

**Joint Project Would Reduce Victoria Falls to 'Mere Rapids'***MB2803122492 Johannesburg SAPA in English  
1125 GMT 28 Mar 92*

[Text] Lusaka, March 28 (SAPA)—The Victoria Falls, listed in 1990 as a world heritage site, may be reduced to mere rapids by the proposed Batoka Gorge hydro electric scheme planned by Zambia and Zimbabwe.

Continuing the debate on the environmental impact of the project, National Heritage Conservation Commission Director Nicholas Katenekwa said this catastrophic effect could result in the falls' environmental status being withdrawn.

In an interview in the Zambian capital of Lusaka on Saturday, Mr. Katenekwa said the Victoria Falls was the single most important landmark in both Zimbabwe and Zambia, and tampering with it should not be allowed.

He explained that flooding the gorges close to the falls would reduce the Victoria Falls to mere rapids, which would be an irreparable dent to the international image of Zambia in terms of conservation and tourism.

The project would entail flooding up to five gorges, which would mean permanently submerging part of the beauty of the falls.

The flooding would result in cancellation of high revenue-earners, like whitewater rafting, which is now popular on the Zambezi on both sides of the border.

"According to revenue returns from both Zambia and Zimbabwe, from whitewater rafting, this sport contributes significantly to both countries' tourism receipts," he said.

**ZIMBABWE****Country Defies CITES Ban on Ivory Trade, Sells Stocks***MB2903140592 Johannesburg Radio RSA in English  
1100 GMT 29 Mar 92*

[Text] Zimbabwe has decided to sell its ivory stocks in spite of the recent ruling by the Convention of International Trade in Endangered Species [CITES], banning trade in ivory. The Zimbabwean Department of National Parks said it had about 25,000 tonnes of ivory which it would start selling with immediate effect.

Zimbabwe, Malawi, Botswana, and Namibia, which have large elephant herds, have formed the southern African center for ivory marketing. The group will meet on 14 April in Namibia to discuss ways of marketing their ivory with countries outside CITES. The four-nation group assured the recent CITES meeting in Kyoto in Japan that they had no intention of behaving irresponsibly as a result of their decision to trade in ivory.

### Qu Geping Reviews China's Environmental Efforts

92WN0262E Lanzhou GANSU RIBAO in Chinese  
5 Dec 91 p 3

[Article by Zhu Youdi [2612 0147 2769]: "Chief of State Environmental Protection Administration Qu Geping Answers Reporters' Questions"]

[Text] The State Environmental Administration, the State Council News Office, and the Xinhua National Press Society today held a press conference for domestic and foreign reporters, at which State Environmental Administration chief Qu Geping answered questions about environmental and development questions in China.

Qu Geping stated that the Chinese government has designated environmental protection as a basic state policy and is keeping to the policy of coordinating social and economic development with environmental development, and that a succession of measures have been adopted to control environmental pollution and prevent environmental damage. In order to improve the environmental situation, the state's investments have been increased from 17 billion yuan during the Sixth 5-Year Plan to 47 billion yuan during the Seventh 5-Year Plan, and expenditures on preventing pollution and improving the environment during the Eighth 5-Year Plan are scheduled to exceed 80 billion yuan, which puts China in the first rank of the developing countries. Thus, while the size of China's total economy has doubled and its population has increased in the last 10-odd years, it has rather effectively avoided environmental degradation and has achieved a definite improvement in the condition of the environment as a whole, thus guaranteeing uninterrupted social and economic development and steady improvement of the people's quality of life. Qu Geping cautioned, however, that the environmental situation with which we must deal in the future is still perilous and that there are numerous problems. For example, the land area nationwide that is subject to erosion is fully 1.5 million square kilometers, the rate of forest cover is only 12.98 percent, and large areas are threatened by progressive desertization. China is still considerably behind the developed countries as regards air pollution control, greening of the cities and management capabilities.

Replying to foreign reporters' questions about the evaluation of the Three Gorges project as related to environmental protection, Qu Geping stated that the project is the subject of extensive concern. Specialists are being organized to evaluate the environmental report. The Three Gorges has both advantages and disadvantages to the environment. For example, it will be effective in preventing flooding on the middle and lower Chang Jiang; and hydroelectric power is the cleanest form of energy and will help to decrease pollution by decreasing coal combustion. But the project may affect certain species of fish that live in the Chang Jiang, and if the

upper reaches of the river are not properly developed, erosion may be intensified, with an attendant silting problem. We are approaching the former matter with great care; we will make a thorough evaluation of all relevant factors and will listen to the full range of opinions and conduct a thorough discussion in order to decrease errors and to effectively resolve environmental and development problems of the Three Gorges region.

Responding to a question about problems with the development of Pudong in Shanghai and the prevention of water pollution, Qu Geping said that the Shanghai city government recently took two steps in order to solve Shanghai's water pollution problems. The first was moving its water intake facilities upstream to a site on the upper Huangpu River where it is free of pollution. This project has already been completed. The second consists of controlling the severely polluted Suzhou River, which passes through the Shanghai region. The total investment in these two projects is more than 200 million yuan. The environmental impact of developing Pudong was evaluated before it was begun. Shanghai proposes to build a new Pudong that is economically flourishing and environmentally of high quality. If the current plans are continued, Shanghai's environmental problems will be steadily reduced.

Discussing environmental pollution in Beijing, Qu Geping said that the atmospheric monitoring data for spring, summer and autumn indicate rather good quality. Beijing's water quality, its municipal environment, and green plantings all have improved markedly in recent years. The photochemical smog and trash overflow that have been troubling some major cities of the world do not exist in Beijing. The air pollution that occurs in winter results from the burning of coal. There has been great progress in such projects as centralized heat supply. During the Seventh 5-Year Plan, Beijing spent 5 billion yuan on preventing pollution, and in the next 9 years it will invest 13 billion yuan to bring about a fundamental change for the better in Beijing's environmental condition. Beijing's application to the World Bank for a loan of \$150 million to solve water and air pollution has been approved, and these funds, together with state-allocated funding, will bring investment on this project alone to a total of \$20 billion yuan.

### Experts Urge Stepped-Up Efforts Against Agricultural Pollution

92WN0262C Beijing ZHONGGUO HUANJING BAO  
[CHINA ENVIRONMENTAL NEWS] in Chinese  
10 Dec 91 p 1

[Article by Peng Bin [1756 3453]: "Pollution Caused by Agriculture Must Not Be Neglected"]

[Text] A recent study by the General Office of Environmental Monitoring, the Ministry of Agriculture, and the China Academy of Environmental Sciences indicates that pollution caused by agriculture itself, including the irrational use of pesticides, fertilizers and plastic

sheeting, is already a significant influence on China's agricultural environment, and the projected trends through the year 2020 are not encouraging. Experts warn that there must be stepped-up research on the prevention of agricultural pollution and an increase in efforts to combat it.

Because China has a large amount of farmland and there is an extensive area in which insects and weeds can develop, in the last 10 years China has annually applied a total of 2.3 billion mu-applications of agricultural pesticides, which each year have prevented the loss of 6 percent of the country's total annual grain output, 10 percent of the annual output of cotton, and 20 percent of the output of vegetables and fruits. These results are noteworthy. But only a small fraction of the pesticide that is applied finds its intended target, and the remainder disperses into the agricultural environment and causes pollution. A national agricultural environment quality survey by the Ministry of Agriculture in 1990 indicated that since the state prohibited the production of organochlorine pesticides in 1983, the levels of these pesticides in grain have declined by an order of magnitude from their early-1980's levels. But their effect on the agricultural environment has not yet been totally eliminated, and new forms of agricultural pollution have come to the fore. At present, 100 million mu of farmland is affected by pesticide pollution. The effective utilization rate of fertilizer is 30 percent; the other 70 percent is blown away or carried by runoff into the soil or into rivers and lakes, causing eutrophication of water bodies or excessive nitrate levels in drinking water. In addition, owing to an inefficient structure of fertilizer use, some areas apply large amounts of chloride fertilizer, which has produced soil pollution. Cases of pollution by poor-quality chemical fertilizers have occurred nationwide, affecting 25 million mu of land. The large-scale use of agricultural plastics produces a major influence on the physical characteristics of the soil, and this "white pollution" of the soil has influenced the growth and development of crops. Nationally, an average of about 5 kg of fragments of plastic sheeting, or fully 43,000 pieces, is left on each mu of farmland, representing a national average rate of 20 to 30 percent.

Experts predict that after the year 2000, improved fertilizer application technology, more effective integrated prevention, and the degradation of pesticides already in the environment will generally reduce pollution by organochlorine pesticides and that this pollution will be essentially eliminated by 2020. But pesticides will remain the principal means of combatting insect pests and weeds, and pollution by replacement pesticides will become a more troublesome problem, expressed chiefly as short growth periods, relatively high residue levels in vegetables and fruit (to which large amounts are applied), and unavoidable pollution of soil, surface water, groundwater and aquatic life. Technological progress and improved means of fertilizer application can raise the fertilizer utilization rate by about 10 percent, but the overall investment in fertilizers will

increase markedly, and a large fraction of the fertilizer that is applied will still not be utilized, but will be dispersed and will pollute the environment and crops. In general, chemical-fertilizer pollution will probably have become more severe by 2020. It will remain one of the serious problems of agricultural ecology. The acute shortage of specialized agricultural plastics cannot be alleviated soon, and pollution by plastic sheeting resulting from expanded agricultural production is likely to increase.

The experts declared that we should emphasize agricultural environmental management, step up agricultural legislation, develop an agricultural environmental-protection manpower pool, perform research on techniques for the efficient utilization of agricultural chemicals and the expanded use of biological protection, popularize the use of optimized combined fertilizers, investigate crop-raising methods in which plastic sheeting is easily recovered and techniques for early removal of the sheeting, adjust the quality and structure agricultural pesticides and increase the use of new preparations, expand the use of mixed fertilizers with high percentages of active ingredients and with a variety of nutrient elements, develop and disseminate high-strength, aging-resistant, low-cost, easily recoverable plastic sheeting, rapidly develop plastic sheeting recovery machinery and increase the recovery rate, and make an effort to develop degradable sheeting and vigorously develop technologies for recycling worn-out sheeting. The relevant departments should devote appropriate attention to the subject and step up their leadership efforts in order to promote research and policy implementation in order to make an effective contribution to the sustained, stable, coordinated development of China's agriculture.

#### Survey Reports on Rural, Township Industrial Polluters

92WN0262D Beijing ZHONGGUO HUANJING BAO  
[CHINA ENVIRONMENTAL NEWS] in Chinese  
14 Dec 91 p 1

[Article by Yang Youxing [2799 0147 5281]: "Nationwide Survey of Rural, Township Industrial Polluters Is Completed"]

[Text] In the last 10 years, environmental pollution by rural and township enterprises has expanded in tandem with their economic development. In some localities, environmental pollution and ecological damage are severe and future prospects are not encouraging. This is the conclusion of a recently-concluded nationwide survey of rural and township industrial pollution.

The survey covered 573,000 rural and township industrial enterprises with a total output of 185.82 billion yuan. They included 366,000 enterprises belonging to the principal polluting industries, with a total output of 100.63 billion yuan.



The survey results indicated that rural and township enterprises use 3.20 billion tons of water and discharge a total of 1.83 billion tons of wastewater. Wastewater discharges by the main polluting industries total 1.22 trillion standard cubic meters, including 2.22 million tons of sulfur dioxide, 140,000 tons of fluorides, and 3.01 million tons of particulates. Industrial solid waste output totals 39 million tons. The survey found that the rate of implementation in China's rural and township enterprise environmental impact evaluation and authorization system was 22.7 percent and that the implementation rate of the "three-simultaneous" system was 14.4 percent. Emission fees of 169 million yuan and pollution penalties of 205.8 billion yuan were collected. There were 2523 pollution incidents, and 5116 polluting enterprises were either shut down or forced to move.

The survey clarified the basic situation with regard to current rural and township industrial pollution and gave a rather comprehensive survey of the amounts and distribution of pollutants produced by the main polluting industries, their energy and water resource utilization, pollutant discharges and control, environmental management, and the harm done by pollution. It included the first quantitative study of primary data on environmental pollution by rural and township industrial enterprises and ended the long-standing uncertainty about pollution by these enterprises. The survey found that pollution by rural and township enterprises occurs at multiple sites and extends over a large area, with a complex variety of pollution types, a high average pollution emission density, a low degree of treatment and control, and poor pollution control results. The survey obtained a large body of complete and systematic data on rural and township industrial polluters, established national, provincial, district, and county-level rural and township industrial pollution source dossiers and set up a microcomputer database on national and county-level rural and township industrial pollution sources. The database provides detailed, reliable information for future thorough investigations of the effect of rural and township industrial pollution on the environment in the countryside.

Even more important, the survey provided data for the implementation of the central authorities' eight-character guidelines of "readjustment, rectification, reform and improvement" for the readjustment of rural and township industrial layout and industry structure and the drafting of rural and township environmental protection plans for the Eighth 5-Year Plan.

The survey was conducted by the State Environmental Protection Administration, the Ministry of Agriculture, and the State Statistical Office and lasted 2 years. It covered 29 provinces, autonomous regions and directly subordinate cities (Xizang and Taiwan were not included). The base year was 1989, and all rural and township industries that emitted pollutants were covered; in addition, rock wool, metal smelting, coke refining, sulfur refining, electroplating, paper making

and similar industries with high pollutant discharge levels and nagging pollution problems were identified as focal points of the survey.

### Southwestern China's Ecological Crisis Examined

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[Article by Yang Minghua [2799 2494 5478], Cheng Dingmao [7115 1353 5399], Gao Lin [7559 2651], Liu Chaoxi [0491 2600 3886], Pu Hanxi [3184 3352 2530], and Wang Xu [3769 2485], Center for Ecological and Environmental Research, CAS, Beijing: "The Ecological Crisis in Southwestern China"]

[Text]

### I. Introduction

Under the impact of an unprecedented population explosion and economic development, China's ecological environment is undergoing major changes. The four southwestern Chinese provinces of Sichuan, Yunnan, Guizhou and Guangxi and the city of Chongqing account for one-seventh of China's area; their population has passed 200 million and constitutes about one-fifth of the national total; and the area has long been poor, backward, and economically underdeveloped. Starting in the 1980's, the southwestern region stepped up resource utilization and economic development, but contraction of forested areas and large-scale agricultural reclamation led to an increase in the frequency and severity of erosion, landslides, mud flows and other natural disasters, combined with pollution by manufacturing and mining enterprises and rural and township enterprises. Thus, the degradation of the region's environment is already producing an adverse effect on the economy and the people's livelihood and is actually threatening their existence. Southwest China has already entered an ecological crisis. The objective of this paper is to analyze the crisis in order to gain insights into the ecological and environmental problems that China is currently facing.

### II. Principal Sources of the Ecological Crisis

Southwest China is in the tropical and subtropical zones, with favorable hydrologic and temperature conditions, and its biological and mineral resources are extremely abundant. But the area consists chiefly of plateaus and mountainous areas; there is very little flatland and arable land is scarce. The flatlands on the Yunnan-Guizhou plateau are few and scattered. Only 3 percent of the total area of Guizhou Province is flatland, and patches of level land with an area of more than 6.6 hectares cover a total area of less than 53,000 ha. Southwest China also has extensive limestone areas; in Guizhou and Guangxi these limestone areas account for respectively 73 percent and 41 of the total land area. Limestone areas suitable for farming are even smaller and more scattered. Thus,

the shortage of arable land has become a major constraining factor on the ability of the land to support the population.

The population of the southwest is increasing uncontrollably, and it has more than doubled since the state was founded. In 1949 the total population of the southwest was 106 million; in 1987 it had reached 211 million. The population density increased from 75.769 persons per square kilometer in 1949 to 152.84 persons per square kilometer in 1987, 36 percent higher than the national average. The population density in Sichuan Province has reached 183.17 persons per square kilometer, and the population density in the heavily populated Sichuan Basin is as high 400 persons per square kilometer. Population pressure on the environment is expressed chiefly as the need for arable land, food, and rural energy resources. In 1953, the per-capita amount of arable land was 0.12 ha, but in 1987 it was only 0.066 ha, representing a decline of 47 percent. The rising population led to an increased requirement for food. The amount of arable land could be increased only by cutting the mountain forests, and large areas of hilly and mountainous terrain were therefore reclaimed as farmland. The amount of forest and grassland has decreased steadily, with a progressive degradation of the environment. For example, in western Guizhou Province, the population of Jin County has doubled since liberation, and its population density is now 249.7 persons per square kilometer, while arable land accounts for 25 percent of the total area, compared with only 19.5 percent after liberation. Of the cultivated land, 70.5 percent is on slopes, of which 27 percent have inclinations of 5 to 15 degrees, 38.8 percent inclinations of 15-20 degrees, 23 percent inclinations of 25-35 degrees, and 11.2 percent inclinations of 35 degrees or more. In addition, the forested area in Jin County has decreased from 36 percent in the 1950's to 17 percent now. Farmland on slopes steeper than 25 degrees accounts for one-fourth of the total unirrigated farmland area of Guizhou and Yunnan provinces.

In the 40 years since liberation, with a rapid increase in population and the reclamation of mountain and other uncultivated land, the scenery and ecological structure of many parts of the southwest have been radically altered from primarily a subtropical mountain forest ecosystem to primarily a mountain farmland ecosystem. Large areas of forest cover have been destroyed, bringing about erosion, landslides, mud flows and similar natural disasters. The backward agricultural economy and excessive growth of population are the direct causes of environmental degradation in the southwest.

Although industry in the southwest has made great process since liberation, production processes are universally outdated, equipment is obsolete, resource utilization is inefficient, and there are high levels of pollution. Particularly since the 1980's, rural and township mining and manufacturing enterprises have been prone

to chaotic management and have produced serious pollution, which has put further pressure on the environment.

### III. Characteristics of Ecological Degradation in the Region

#### A. Deterioration of Forest Ecosystems

The southwestern region includes subtropical, tropical plateau, and mountain forest ecosystems. In the early 1950's, all four provinces had at least 30 to 50 percent forest cover, and there were still areas of virgin forest. In the last 40 years, the amount of forest cover has declined sharply: it now is only 24 percent for Yunnan, 22 percent for Guangxi, 12.6 percent for Guizhou, and 13.1 percent for Sichuan. The area of the tropical rain forest, which is unique in China, has decreased in the Xishuangbanna region of Yunnan from 70 percent in the 1950's to less than 34 percent at present. Of 53 provinces in the agricultural regions of eastern Sichuan, more than half have only 5 to 8 percent forest cover.

The crisis of the forest ecosystems is not limited to the rapid contraction of forested area, but also involves a decline in the quality of the forest ecosystems and a degradation of their functioning and structure. For example, of the remaining 24-percent forest cover in Yunnan, the amounts of timber forest and bamboo forest are declining at average rates of respectively 1.93 percent and 0.92 percent a year, and the relative proportion of sparse woods is increasing at an annual rate of 4.38 percent. The total accumulation of the forests has also declined, from 260 million cubic meters in 1973 to 230 million cubic meters in 1985, while conversely, the accumulation of sparse woods is increasing at an annual rate of 1.2 percent. The accumulation of areas with scattered trees has increased by 140 million cubic meters. The above figures indicate that Yunnan's forest ecosystem is declining from forest to sparse woods to treeless condition. Similar developments are occurring in the other provinces or regions of the southwest. Because the rate of consumption of forest resources in the region greatly exceeds their growth rate, unless efforts are made to create large areas of fast-growing, highly productive forests, by the end of the century the southwest's forest resources will be in danger of exhaustion.

The reverse evolutionary process from forest to shrubland to grassland brought about by cutting of the forests is producing great difficulties for reforestation of the southwest. The primary reason is the extensive limestone formations in the region and the poor soil conditions: if the forests growing on the limestone formations should be destroyed, the very thin soil cover will rapidly be eroded by precipitation, exposing the bedrock, and it will be difficult to restore the vegetation. This situation is particularly severe in Guizhou, where it is locally referred to as "petrification." If the trend is not controlled, it will take only 30 years for Guizhou's limestone mountain areas to become completely denuded.

The southwest has long been called the "kingdom of species": it contains tropical, subtropical, temperate zone and cold-temperate zone animals and plants, representing more than half the country's entire inventory of species. The Xishuangbanna region, which represents only 1/500 of the country's area, has about 5000 species of higher plants, about 1/6 of the total number nationwide. The area is also one of the richest in land fauna, with more than 250 species of rare animals. The destruction of the forests will also cause a serious decline or disappearance of species. The southwest is facing a crisis situation in regard to the destruction of species.

There are currently no accurate data on the types or numbers of species that are becoming extinct in the southwest. But scattered data suggest a marked contraction of the ranges of the elephant, the otter monkey, many species of gibbons, the golden monkey, the South China tiger, the giant panda, the red-bellied tragopan, and the peacock peasant and a sharp decline in their numbers. Among the higher plants, such gymnosperms as the silver fir and such angiosperms as the dove tree and the Chinese tulip tree have also declined greatly in abundance owing to their destruction by man. B. Serious Erosion

The deterioration of natural ecosystems, especially forest ecosystems, is a direct cause of increasing soil erosion. At present, about 610,000 square kilometers of land in the southwest (45 percent of the total land area) is experiencing soil erosion, and the average soil loss is 1.67 billion tons per year. The breakdown of soil loss by provinces is as follows:

Province	Area subject to erosion ( $10^4$ km <sup>2</sup> )	Percentage of area of province	Percentage of all erosion-prone area in southwest	Annual average soil loss ( $10^8$ tons)
Sichuan	38	67	62	6.2
Yunnan	11.3	30	18.5	5.2
Guangxi	6.5	27.5	10.7	4.3
Guizhou	5	28	8.2	1.0

It will be seen that the scope of soil erosion in the southwest is expanding rapidly. In the 1950's, the area experiencing erosion in Sichuan was only 95,000 square kilometers; but the figure had tripled by the 1980's. In Guizhou, the area subject to erosion in 1964 was 35,000 square kilometers, but it had increased by about 43 percent in little more than 20 years. Farmland on hills accounts for about 62.5 percent of all arable land in Sichuan, and although the purple soil of the region has a high natural nutrient content, intense erosion is converting large amounts of good farmland into poor land. The annual decrease in the grain output of Sichuan as a result of erosion has reached 4.9 billion kg, or 12 percent of the province's total grain output. C. Serious Silting and Pollution of River and Lake Ecosystems

The southwest has rich aquatic resources, but they are nonuniformly distributed and are variable over time, and the conditions for their utilization are poor. Proper use of water resources is a major problem in maintaining the ecological balance in the southwest.

Silting of watercourses as a result of erosion has already led to the abandonment of many hydraulic engineering installations. The Daotianhe Reservoir in Bijie District, Guizhou, was commissioned in 1965 with a rated annual capacity of 6.5 million cubic meters. But after 20 years it had accumulated 2.07 cubic meters of silt, equal to a third of its nominal water capacity. In the 1950's, there were 46 plateau lakes with areas of 5 square kilometers or more, but by 1970, there were only 27 with areas of 1 square kilometer or more. Erosion in Sichuan, Guizhou and Yunnan, which form the upper part of the Changjiang River Basin, unavoidably increased the river's solid load. Multiyear data from the Yuchang Hydrographic Station indicate that the annual average solid load has increased to 530 million tons, one-third as great as that of the Yellow River; this is one of the factors responsible for the serious silting of Dongting Lake downstream.

Water pollution is a further problem. Most of the important cities of the southwest are situated along rivers, at confluences of rivers, or on the shores of plateau lakes, and the distribution of medium and small cities is similar. As a result, the river systems and lakes are all subjected, in varying degrees, to discharges of domestic sewage and industrial effluent from cities. For example, the Tuo Jiang River in Sichuan is polluted by industrial waste and sewage from Neijiang, Zigong, and the various smaller urban areas on its upper reaches, and more than half of the water-quality indices that express organic pollution indicate that the water is no longer suitable for drinking. Every year, Chongqing discharges 1.3 billion tons of industrial waste and 100 million tons of domestic sewage into the Jialing River and the Changjiang. Water pollution is a subject of concern in all provinces of the southwest.

#### D. Increasing Frequency and Severity of Natural Disasters

Such natural disasters as droughts, floods, landslides, and mud and rock flows have always been a problem, but with the recent ecological degradation in the region, natural disasters are becoming more frequent and severe. The interval between droughts or floods in Sichuan and Guizhou is becoming shorter. In the 1980's, the frequency of major droughts was 5 times that before liberation, and the frequency of floods in Sichuan was 3 times the former value. Before liberation, a major drought occurred in Guizhou once every 3.5 years, but since 1972, the frequency is once in less than 2 years. Before 1970, the area of farmland affected by disasters was 434,000 hectares, but in 1978 it had reached 602,000 hectares, an increase of 38.7 percent. Landslides and mud flows have become increasingly serious in Yunnan. In 1984, the Dongchuan mud flow caused an

economic loss of 11 million yuan; in June 1985, landslides and mud flows in the Daying River basin caused direct economic losses of 11.7 million yuan in Yingjiang and Lianghe Counties. A mud and rock flow that occurred in Zhaotong and Qiaojia counties in 1983 blocked the Jinsha River for 20 minutes, and a landslide in 1985 wiped Bijiang County off the map.

Nationally, the rate of occurrence of natural disasters has increased by a factor of 1.41 since the 1970's, but in the southwest it has increased by a factor of 2.27. In certain provinces and regions, floods, droughts, hail, mud flows and landslides are occurring at 3 to 10 times their former frequency.

#### E. Extremely Severe Acid Rain and Air Pollution

Acid rain and air pollution in the southwest caused by coal combustion and similar factors are more serious than anywhere else in the country. The concentrations of atmospheric sulfur dioxide and particulate matter in major cities of the southwest in 1985 everywhere exceeded the national level-2 air quality standard; the situation was most severe in Guiyang, Chongqing and Liuzhou, where the levels of these pollutions exceeded the national level-3 air quality standard. The southwest is one of China's main coal-producing regions. Coal production is centered in eastern Guizhou, southern Sichuan, and eastern Yunnan. In 1985, atmospheric emissions of sulfur dioxide in the southwest totaled about 2.5 million tons, or 19 percent of the national total, and particulate emissions were 1.67 million tons, or 13 percent of the national total. Acid rain in the southwest occurs primarily in the Sichuan Basin, centered on Chongqing, the central Guizhou region centered on Guiyang, and the Liuzhou and Nanning areas of Guangxi, and the Gejiou and Zhaotong areas of Yunnan.

A further harmful aspect of air pollution is fluoride poisoning resulting from coal burning in the countryside. The coal produced in the southwest, and particularly in western Guizhou and eastern Yunnan, has a very high fluoride content, so that the air in households and the surfaces of foods that are baked in coal ovens contain large concentrations of fluoride. As a result, fluoride poisoning is common throughout the region, and the incidence of fluoride spotting on the teeth of children is 90 percent or higher. More than half the population of Guizhou suffers some degree of illness as a result of fluoride poisoning.

#### F. Major Adverse Effects on Resources and the Environment Resulting From Inadequate Management of Small-Town Enterprises

Many of the rural and township enterprises in the southwest engage in coal mining and the mining and smelting of lead and zinc ore, antimony ore, sulfur and iron ore and the like. Because they are small-scale, scattered operations, using primitive equipment and out-of-date technologies, and because in addition there is a lack of policy guidance, technical guidance and unified oversight, certain rural and township enterprises extract

the rich ore and discard the lean ore. Such unsystematic operations have a low recovery rate, and in addition they compete with state-run enterprises for ore deposits, resulting in a serious waste of resources. For example, the Wangjiazhai coal mine in a lake area competed with a state-run enterprise and caused the latter to become flooded, with a loss of nearly 100 million yuan. The problems are even more severe in the case of smelting: not only are resources wasted, but serious environmental pollution is produced. For example, Maguzhen in western Guizhou has 800 trough furnaces used for local-method smelting, which extracts only 20 to 50 percent of the zinc from a lead-zinc ore; large amounts of the accessory elements are discharged into the environment as waste, producing serious lead pollution. In addition, extensive local-method refining of sulfur is practiced in the the Sichuan-Yunnan-Guizhou borderland. The minerals are usually mined locally and refined in locally built furnaces. The sulfur recovery rate is only 20 percent, and for each ton of sulfur that is produced, 1.1 to 1.8 tons of sulfur dioxide, 0.15 to 0.3 tons of hydrogen sulfide, and 8.5 to 12 tons of furnace dross are discharged. These pollutants generally have a depressive effect on vegetation over an area of more than 10 square kilometers around the furnaces, and the ecosystem suffer serious damage. In addition, some local-method coke plants, small paper plants, white-arsenic plants, and food processing and brewing enterprises pay no heed to waste management, and they too pollute the environment.

#### IV. The Effect of the Ecological Crisis on Society and the Economy

The ecological crisis of the southwest has seriously affected the social and economic development of the region and has caused huge losses to the economy. This is an additional important factor in the region's poverty and distress.

##### A. Losses to the Local Economy as a Result of the Ecological Crisis

The damage that ecological degradation causes to economic development is usually gradual and indirectly manifested, so that it may not be immediately recognized. But the economic loss resulting from natural disasters is clear and immediate. The degradation of the region's environment has recently caused an increase in the frequency of natural disasters in the southwest. From 1979 to 1986, the direct economic loss in the region as a result of natural disasters totaled 42.032 billion yuan, equivalent to an average annual loss of 5.254 billion yuan. This annual loss is equivalent to 5 percent of the region's total agricultural and industrial output and is 63.1 percent as great as the national average loss from natural disasters since liberation.

Between 1980 and 1986, natural disasters in Guizhou have caused a direct economic loss of 1.08 billion yuan, equal to 9.4 percent of the province's total industrial and agricultural output and to more than 8 percent of local government revenues over the same period. The Sichuan



floods of 1981 decreased grain output by 1.34 billion kilograms, and the direct economic loss was 2.5 billion yuan. In 1986, natural disasters in Guangxi decreased grain output by 950 million kg and caused a direct economic loss of 190 million yuan, equal to 10.8 percent of the total earnings of the economy for the year and to 70 percent of government revenues. In counties where the environment has been severely degraded, the loss from natural disasters is even more serious. For example, in Xuanwei, Yunnan, the direct economic loss from natural disasters in 1986 was equal to 14.4 percent of total industrial and agricultural output; the loss in Nan-jian county was 18.4 percent of total output and 5.5 times the county's revenues.

#### B. Environmental Pollution Endangers Human Health and Damages Resources

Estimating the economic loss that results from pollution is a complex problem of environmental accounting. There are not yet enough data to allow a clear estimate, and our only recourse is to use some of the available data for a crude damage analysis.

The economic loss resulting from air pollution and acid rain in the southwest consists primarily of serious corrosion damage to materials. The rate of corrosion of carbon steel by acid rain is 152 micrometers per year in Chongqing and 67.3 micrometers per year in Guiyang. Both of these figures are significantly higher than those for Nanjing, Shanghai, Guangzhou, and Beijing. Acid rain accelerates the aging of materials coated with oil-based paints, and in cities with serious air pollution and acid rain, the surfaces of metals protected by galvanizing, chrome plating, painting and other protective treatments will generally begin to corrode after 6 to 12 months. Serious air pollution also damages buildings and cultural treasures. For example, the features of the carved statues exposed to the weather outside the Anshun city library are unrecognizable, and the exposed parts of the Wenfeng Pagoda inscriptions at Duyun have become indistinct. Acid rain also leaches nutrients out of the soil and decreases soil fertility, thus posing a latent threat to agricultural and forest ecosystems. In June 1982, acute damage to 10,000 mu of paddy rice occurred in Ba County, Chongqing city, with a total decrease in output of about 400,000 kg. The effects of air pollution on human health are even more difficult to estimate. For example, in the local-method sulfur refining district in the Sichuan-Yunnan-Guizhou border area, the incidence of upper respiratory tract disease in employees is over 95 percent. Fluoride poisoning in the rural populace of western Guizhou as a result of the combustion of coal affects the health of 15 million persons. Serious benz(a)pyrene pollution in Xuanwu, Yunnan, has made it one of the most cancer-prone areas of the country.

Water pollution causes economic losses of comparable severity. Statistics for the first half of 1987 indicate that in Sichuan, the direct economic loss from water pollution was: grain, 117 million kilograms; cotton, 160,000 dan; oil crops, 70,000 dan; fish, 95,000 kg; the equivalent

value of these losses was 412 million yuan. Compensation paid to victims by polluters totaled 173 million yuan.

#### C. The Ecological Crisis Is Seriously Constraining the Economic Development of the Southwest and Adjoining Regions

The economic crisis has become a major hindrance to regional development in the southwest. Such disasters as landslides, mud and rock flows, and flooding caused by environmental degradation increase the economic burden of the southwestern region, which was already underdeveloped and is now even more hard pressed.

The construction of the Three Gorges project, which is attracting world attention, will produce an immense effect not only on the development of the southwest, but on the development of the entire country and in particular of the Changjiang valley. But the greatest risk of the Three Gorges project consists of the ecological problems involved with large-scale resettlement in the reservoir area and the possible ecological consequences. The Three Gorges reservoir area is a hard-pressed mountain district where the per-capita amount of arable land is small, the percentage forest cover is low, and 90 percent of the land in the reservoir region already suffers from erosion. In this region, with ecological degradation and an overload on the carrying capacity of the land, inundating the best farmland in the area and resettling a million people locally involves a risk that is clearly evident. As a result, the question of whether the southwest's fragile regional ecosystem can withstand the heavy impact of the Three Gorges project is the key to whether the project will prove beneficial.

The southwest includes the upper reaches of the Changjiang and the Zhu River. The region's ecological deterioration not only has become a hindrance to economic development, but in addition is directly affecting the middle and lower reaches of these two major rivers. The Changjiang valley, which contains a fifth of China's area and a fourth of its population, produces 40 percent of the country's total agricultural and industrial output and 44 percent of its crop output. In addition, the river is a major transport artery, accounting for about 70 percent of the country's river transport. But owing to severe erosion in its upper reaches, i.e., in the southwest, silting and flooding are occurring in the middle and lower reaches of the river, threatening industrial and agricultural production in these economically developed downriver areas. From 1951 to 1983, the Changjiang carried an average of 109.4 million cubic meters of sediment into Dongting Lake each year; over 30 years, the amount of sediment that has accumulated would be sufficient to produce a uniform layer about 1.1 m thick over the bottom of the lake and the flood channel, so that sand bars would be exposed in the lake for a large part of the year. The lake's natural surface area is now only 2691 square kilometers, 45 percent of the area at the time of its flourishing. Silting and land reclamation have decreased the water capacity of the lake, by 40.6 percent,

from 29.3 billion cubic meters in 1949 to 17.4 billion cubic meters in 1987. The elevation of the bed of the lake and river has necessitated continuous building up of the embankments in the area, which has required huge amounts of manpower, materials, and money, but even so, in the 33-year period following liberation, 1.54 million hectares of the lake region suffered flooding, equivalent to an average of 44,000 hectares per year. In the autumn of 1988, major flooding occurred in the area, with water levels reaching the warning stage on 115 embankments and the danger stage on 68 embankments; three dikes protecting areas of 10,000 mu or more burst, and 21 embankments were breached or burst, producing major economic losses.

Thus, it is evident that the ecological crisis in the southwest is seriously affecting regional development, threatening human life, and hindering economic progress.

#### **Automated Monitoring Network for Environmental Pollution**

92WN0262A Beijing XIANDAIHUA

[MODERNIZATION] in Chinese Vol 13 No 12, Dec 91 pp 19-21

[Article by Yu Zhengran [0060 2973 3544]: "Pioneer the New Field of Environmental Pollution Monitoring"]

[Text] Coal is China's principal energy source, and its industrial and domestic use accounts for more than 70 percent of total energy consumption. As a result, China's air pollution is derived chiefly from coal. Especially during the heating season, the levels of many of the main pollutants exceed national limits in many cities, and they already pose a threat to human health. According to the figures from the 1990 national environmental status report, in 1989, nationwide emissions of flyash totaled 13.98 million tons, and those of sulfur dioxide totaled 15.64 million tons, slightly higher than in the preceding year. Urban air pollution was rather serious in the winter and spring and relatively mild in the summer and autumn. Particulate levels were more serious in the northern cities and sulfur dioxide pollution was more serious in the southern cities.

The factors causing atmospheric pollution in China are as follows: natural wind transport of large amounts of industrial emissions into low-lying areas and river valleys; the use of short smokestacks; combustion of low-quality fuels with high sulfur content; incorrect designed plants or incompetent plant maintenance; a lack of effective management of pollutants; and inadequate pollution control equipment.

The usual approach to controlling air pollution is to draft environmental standards and pollutant emission standards and to issue the requisite air pollution control laws and regulations and atmospheric environmental management measures.

Environmental monitoring is an important aspect of air-pollution control. Data on air quality and on pollutant emissions obtained by monitoring are used, along with other inputs, to draft plans and measures for preventing pollution. Thus, environmental monitoring must be timely and representative. Based on these fundamental requirements, after repeated testing and documentation, a practicable state air-pollution monitoring network whose backbone includes 72 cities and regions has been set up, and the provinces and cities have established corresponding networks within their jurisdictions. To obtain timely and correct information on the status of air pollution in China's cities, foreign monitoring technologies were analyzed and modern, progressive technologies suited to China's conditions were imported. Since 1984, real-time control systems for automated air pollution monitoring have been installed in 26 main cities in the state network, namely, Beijing, Shanghai, Lanzhou, Guangzhou, Shenyang, Anshan, Dalian, Jilin, Changchun, Shizuishan, Xi'an, Zhengzhou, Tangshan, Wuhan, Changsha, Nanjing, Suzhou, Nantong, Hangzhou, Jinan, Qingdao, Hefei, Chengdu, Chongqing, Baotou, and Taiyuan. Thus, a real-time air pollution monitoring network covering these 26 cities is in place. As the need arises, these cities can use facsimile equipment to transmit data and images by wire to the environmental data center in Beijing. Further plans are being made for a computer network linking Beijing and other cities, and ultimately for the modernization of the air-pollution monitoring network.

#### **The Objectives of Establishing an Automated Air-Pollution Monitoring System**

In general, the establishment of any type of monitoring network should be based on multiple objectives. Although a multipurpose system is not practicable in the present case, with suitable adjustments, a monitoring network geared to one primary objective can be made to serve other objectives. The chief aims in establishing such a system are as follows.

1. To obtain data on the type and degree of local air pollution and determine whether the conditions meet state environmental quality standards.
2. To judge the environmental effects of pollution sources, to evaluate prevention efforts, and to provide data for pollution control and management.
3. To institute control monitoring of major, serious pollution sources, to prevent pollution incidents from occurring, and to conduct oversight as provided by law.
4. To perform simulation studies of the diffusion of pollutants based on meteorological characteristics and on a large body of long-term monitoring data in order to prepare for short- and long-term forecasting of air pollution.
5. To accumulate a body of long-term monitoring data that, in combination with local epidemiological and

environmental surveys, will provide a scientific basis for the drafting or revision of environmental quality standards.

### **Organization of an Automated Air Pollution Monitoring System**

The monitoring system uses a microcomputer-controlled network and performs automated functions ranging from data collection and transmission to processing, computation, storage, and text and graphic output, as well as instrument zeroing and calibration; it thus has become an unattended, real-time control system.

The system is made up of five components: monitoring substations, control centers, the communication system, the quality assurance system, and the support system.

#### **1. Monitoring Substations**

Each city sets up at least three to five monitoring substations. Large, economically important cities may have as many as nine substations. The characteristics that are usually monitored are sulfur dioxide, nitrogen oxides, carbon monoxide, total suspended particulates (TSP); and such meteorological characteristics as temperature, humidity, wind direction, wind speed, and air pressure. Some cities also collect data on ozone, methane hydrocarbons, nonmethane hydrocarbons, and total hydrocarbons.

The organization of a monitoring substation is shown in Fig. 1. The station is equipped with analog-digital converters and digital interfaces, dedicated microprocessors, and the necessary peripheral devices. Each set of instrument readings is transmitted via the data collection units to a dedicated microcomputer, which stores and processes the data. The data collection unit generally has 16 channels, and each city can therefore add other functions as needed. The substations can perform instrument zeroing and calibration, data collection and data processing in the automated mode or can perform all functions under the direction of the control center in the slave mode.

#### **2. The Control Centers**

At present, China largely uses combined centralized-and-distribute microcomputer-controlled networks, while the individual cities use fully centralized control networks (Fig. 2). The former alternative is the more flexible. Control centers are usually equipped with a front-end processor and a back-end processor. The front-end processor is used to control normal system transmissions and the back-end processor for data processing and computation. The microcomputer is equipped with such peripherals as displays, diskette drives, printers, and the like. The control center can perform the following functions: (1) data collection, in which it issues commands in order to collect the data from the substations; (2) system control functions, i.e., control of individual substations, including starting and stopping their equipment, sampling, transmission of data, zeroing and calibration and

the like, so that the monitoring substations can run unattended; (3) monitoring and polling to determine the operating condition of the system at any time; (4) processing of the data that have been collected and drafting of reports.

#### **3. The Communications System**

There are two types of data transmission methods: wireless transmission and line transmission. Because China's cities cover large areas, the substations are far apart, and land transport is inconvenient, most of the cities use the wireless method. The control centers are equipped with omnidirectional antennas to receive the data transmitted from the substations. After demodulation, the data are fed to the computer via an RS-232C interface. The substations are equipped with directional antennas and modems. China's dedicated environmental-protection data transmission frequencies are 223.150 and 230.150 MHz.

#### **4. The Quality Assurance System**

In order to assure normal operation of the system and to obtain correct and reliable data, it is necessary to set up effective quality assurance laboratories. The laboratories should be equipped with the following: (1) equipment for calibrating flow rates; (2) basic and working standard gases for calibrating monitoring instruments; (3) meteorological instrument standards; (4) portable testing and calibration equipment.

#### **5. The Support System**

To assure normal operation of the system's monitoring instruments, computers and communications facilities, maintenance and servicing laboratories have been created. These laboratories all have general and specialized electronic testing and servicing equipment and tools that they can use for routine or emergency repairs.

In the United States, Japan and certain other developed countries, automated air pollution monitoring systems are well established, use advanced technology, are highly reliable, and have become the principal means of routine monitoring. Although China made a late start, by importing and absorbing advanced foreign technology we are now approaching the world state of the art. The systems in Beijing and Lanzhou were imported directly from the U.S., and the assimilation of advanced foreign technology has been very effective.

In the 6 years during which China's automated air pollution monitoring network has been in existence, it has given good results. This project is an innovation in environmental protection and is a product of efforts to make environmental monitoring increasingly thorough. It has set the pace for the new environmental monitoring field in China and has narrowed the technology gap between China and the developed countries. It has made atmospheric environmental monitoring more thorough and is providing more representative data. It has already furnished a large body of information, which has been of

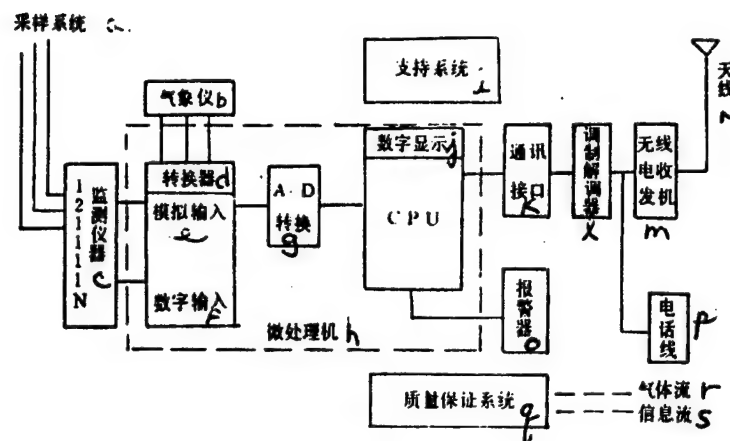


Figure 1

Key: a. Sampling system; b. Meteorological instruments; c. Monitoring instruments; d. Converters; e. Analog inputs; f. Digital inputs; g. A/D converter; h. Microprocessor; i. Support system; j. Digital display; k. Communications interface; l. Modem; m. Radio transceiver; n. Antenna; o. Alarm device; p. Telephone line; q. Quality assurance system; r. Gas flows; s. Information flows

great importance in evaluating environmental quality, analyzing patterns of change, and understanding developmental trends. We have created a pool of technical manpower in the automated monitoring field and have trained a backbone contingent to develop high-technology environmental monitoring. The systems are already operating effectively in some cities, where they have replaced manual sampling and are providing reliable data for integrated quantitative evaluations at the city level. As China's environmental protection effort progresses, the automated pollution monitoring network will be able to produce even better results.

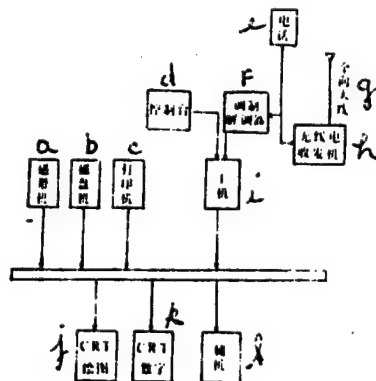


Figure 2

Key: a. Tape drive; b. Disk drive; c. Printer; d. Console; e. Telephone; f. Modem; g. Omnidirectional antenna; h. Transceiver; i. Mainframe; j. CRT graphics; k. CRT data; l. Peripheral computer

### Achievements in Protecting Cranes Noted

OW1603123592 Beijing XINHUA in English  
1159 GMT 16 Mar 92

[Text] Guiyang, March 16 (XINHUA)—China has made great progress in protecting cranes and have placed the rare bird under first class state protection.

Bai Jingyu, director of the China Crane Conservation Committee, a branch of the China Wildlife Conservation Association, said that 19 provinces, autonomous regions and municipalities which have crane habitats have participated in the crane protection effort.

Thus far, China has opened 18 crane nature reserves which cover over 720,000 hectares.

The Zhalong nature reserve in northeast China's Helongjiang Province is the nation's largest nature reserve in crane protection program. Some 243 cranes now nest in the reserve, 54 more than six years ago, and one-third of the country's total crane population.

While the Zhalong reserve is the crane's breeding grounds, they migrate to nature reserves in south China's Jiangsu, Zhejiang and Jiangxi Provinces during the winter.

According to latest reports, only 15 species of cranes, all of which are facing extinction, have been found in the world, and, at present China is home to nine species of the bird.

As part of an effort to better protect the cranes, Chinese experts have conducted exhaustive research into the varieties and distribution of cranes in China, as well as their breeding habits, growth patterns, and domestication. Chinese scientists working at the Zhalong reserve have achieved great success in breeding and raising cranes. In addition, the Beijing zoo has achieved notable



success in using breeding black neck cranes by artificial insemination. China has also introduced five species of foreign cranes.

In recent years, the Zhalong reserve in Heilongjiang and Yancheng reserve in Jiangsu, and other crane reserves throughout the country, have hosted over 100 groups of foreign experts who came to China to study cranes.

At present, experts from the Russian Federation, Mongolia and China are preparing to establish a new crane nature reserve near Xingkai Lake in Heilongjiang Province.

### **Nationwide Campaign To Focus on Urban Environmental Conditions**

*HK1703044192 Beijing CHINA DAILY in English  
17 Mar 92 p 1*

[By staff reporter Zhu Baoxia: "Campaign To Curb Pollution Geared Up"]

[Text] As the country moves into a new phase of economic reform, environmental problems have become a top concern for both the Chinese people and the government, both of whom are striving to control the growing sources of urban and industrial pollution, said a leading environmental official.

The nationwide environmental drive will be carried out by way of comprehensive inspections of urban environmental conditions, and through imposing compulsory waste-disposal rulings on industries which discharge waste into the surroundings—in addition to the implementation of a "licensing system" on waste discharge, said Qu Geping, director general of the National Environmental Protection Agency (NEPA).

In an interview with China Daily yesterday, Qu revealed that his agency—with the help of the Ministry of Construction and the National Patriotic Health Campaign Committee—is set to organize an environmental inspection in a number of major cities this year.

The cities will be appraised according to their environmental condition, urban cleanliness and public appearance, and be given due ratings accordingly.

Enterprises that discharge waste into public space must apply for permission from the local departments in charge and be fined for exceeding the allowed limits.

Qu noted that so far some 12,500 industrial units in 150 cities have applied for such licences.

In the 18th pilot cities and counties selected by NEPA has the first batch to adopt that new system, more than 3,600 enterprises have been granted licences to discharge waste water, for which 575 million yuan (\$106 million) in licence fees were collected. The money helped to finance the construction of 523 pollutant disposal projects.

As a result, less harmful wastes were discharged into the environment in these cities than in the previous year.

And NEPA has decided to extend the system nationwide to help improve atmospheric conditions in the country this year.

Qu also disclosed that an estimated 15 billion yuan (\$2.8 million) is expected to be invested in environmental control projects this year, an increase of 4 billion yuan (\$740 million) over last year.

Regarding international co-operation, Qu stressed that the country would actively participate in global environmental scientific exchanges and collaborations in the coming years, and would import more foreign funds and advanced techniques.

According to the director, soot contamination, industrial pollution and deteriorating ecological conditions remained the major "headaches" for environmental administrative personnel.

Data show that about 75 percent of Chinese industries and 85 percent of urban households use coal fuel for production, cooking and heating—a situation that is expected to continue until the end of the century.

In 1990, Chinese industries produced 24.8 billion tons of waste water, 80 percent of which were poured untreated into rivers, seas and lakes. Industrial and domestic refuse amounted to 6.75 billion tons, taking up some 56,000 hectares of land space.

### **State To Continue Tight Control of Waste Disposal at Sea**

*HK1803060692 Beijing CHINA DAILY in English  
18 Mar 92 p 3*

[By staff reporter Xie Liangjun: "China Is Strict on Waste Disposal"]

[Text] The State Ocean Administration has vowed to continue to tightly control the dumping of wastes at sea by Chinese companies and institutions in a move to keep Chinese coastlines and territorial waters from being contaminated.

Administration officials with the Department of Ocean Management and Monitoring said in Beijing that the Chinese government has always discouraged the dumping of waste at sea, adding that much stricter limitations over disposal of industrial wastes are being imposed.

"Only those wastes which cannot be dealt with or will produce great harm to people if they are abandoned on land are permitted to be dumped at sea," the officials said, "and anyone who dumps waste must apply for dumping permits in advance."

The wastes can only be dumped in government-designated marine dumping areas.

The State Council, China's highest governing body, has so far approved some 28 marine dumping areas, and is considering approval of another 15 in the near future.

The State Council approved and published marine waste dumping regulations in 1985, specifying substances that cannot be dumped and those requiring special permits.

According to administration officials, China's ocean management agencies throughout the country last year dealt with a total of 335 dumping applications from more than 100 Chinese companies and institutions.

And they agreed to issue dumping permits in 326 cases involving a total of 49.127 million cubic meters of waste.

Most applicants were construction companies, harbour administrations and key State project contractors.

The officials noted that of all these wastes, about 99 percent were either dredged soil from sea lanes or coal cinders.

They pointed out that last year Chinese ocean agencies also uncovered 28 illegal dumping cases, all of which were solved.

The cases included the illegal dumping of waste by Zhanjiang Seaport Administration in Guangdong Province and Shanghai City Dwelling Construction Company.

The officials stressed that they would continue to strengthen testing and monitoring in the dumping areas to prevent pollution and to avoid damage to the ocean environment and resources.

Under Chinese regulations, the dumping of high-level radioactive wastes is banned.

#### **Fuel Forest Development Plan Devised**

*HK2203072292 Beijing CHINA DAILY (BUSINESS WEEKLY SUPPLEMENT) in English 22-28 Mar 92  
p 3*

[By Wu Yunhe: "China Plans To Replace Trees Used for Fuel"]

[Text] Because many of the country's 900 million farmers still rely on forests for their only cooking fuel,

China has worked out a fuel forest development plan to fill the gap between supply and demand during the next four years.

Although the annual supply capacity of fuel forest currently is about 140 million tons, consumption exceeds 250 million tons in the rural areas, posing a threat to the nation's forest resource, according to a reliable source with the Ministry of Forests.

The plan involves development of a 2.6-million-hectare fuel forest during the 1991-95 period.

Official departments and banking institutions are urged to strongly back the development of artificial forests, mainly in south and central China.

By the year 2000, China is expected to establish at least 6 million hectares of new fuel forest, making up 10.5 percent of the country's total artificial forest acreage.

At present, because of the farmers' huge demands, at least 100 million tons of natural forest are lumbered annually for fuel use, 30 percent of the nation's annual consumption of forest resources.

As a result, the government is currently striving to fulfill two vital tasks:

- issuing a series of strict regulations to protect forest resources

- building abundant fuel forest to meet farmers' fuel consumption needs.

China has attached importance to developing forests over the past decade, said Liu Guangyun, Vice Minister of Forest, in a recently-published article.

He said that during the past ten years, the country has created nearly 4 million hectares of fuel forest.

The present total of 31 million hectares of artificial forests ranks China as first in this field in the world, Liu noted.

## AUSTRALIA

### Minister Says Nation's CFC Use Halved Since 1986

BK2403081892 Melbourne Radio Australia in English  
0500 GMT 24 Mar 92

[Text] Delegates from Southeast Asia and the South Pacific have gathered in Canberra for a conference on the ozone layer. During an opening address, Australia's minister for environment, Ros Kelly, told the conference that the nation's consumption of ozone depleting CFC's [chlorofluorocarbon] has halved since 1986.

Ms. Kelly said this achievement puts Australia four years ahead of the current Montreal Protocol timetable for cutting back the use of CFC's.

Over the next three days, the representatives from industry, government, and community groups will discuss strategies to phase out the use of substances which lead to depletion of the ozone layer.

## JAPAN

### Experts Detail Research on Global Warming

92WN0213A Tokyo NIHON SANGYO GIJUTSU  
SHINKO KYOKAI in Japanese 13 Nov 91 pp 1-16,  
19-50

[Five lectures presented by Ryoichi Imasu, Shoji Ishisaka, Shinya Yokoyama, Koichi Mizuno, and Osamu Ishitani at the first research lecture meeting of the Institute of Resource Environment Technology Research, November 13, 1991: "In Facing Challenge of Global Warming"]

[Text]

### Artificial Satellite Observation of Substances Responsible for Global Warming

#### 1. Introduction

In recent years, the problem of global warming has been attracting worldwide attention. The cause of global warming at present is attributed to increased emissions of such infrared-absorption gases as carbon dioxide and methane. At the present time, we know very little about the behavior of these substances in the atmosphere and the scale of their global distribution. A strong demand has been placed on the scientific community to explain the basic causes of global warming, and industrial nations throughout the world are currently pursuing plans to observe minor constituents of atmospheric composition, using a satellite-mounted sensor. Currently under consideration in Japan is a project designed to measure the concentration level of each atmospheric gas on a global scale, using an IMG (Interferometric Monitor for Greenhouse Gases) sensor mounted on the Advanced Earth Observing Satellite (ADEOS). The launching of

the satellite is scheduled for 1995. The following sections will introduce the categories and principles of the satellite measuring method of atmospheric composition, including a summary of each country's observation plan, development of the IMG, and results which can be expected from the satellite observation, as well as problems which will require attention in the immediate future.

#### 2. Categories of Measurement Methods

In measurement of minor atmospheric gas constituents, a wide electromagnetic wave zone, ranging from ultraviolet rays to a microwave, will be used. Figure 1 shows major measuring techniques, from which an optimal method can be selected, taking into consideration the types of gas, the levels of concentration, and the required degree of space resolution involved. Shown in parentheses are the interaction between measurement-related main electromagnetic waves and atmospheric molecules. Of these, the IMG corresponds to the low sphere infrared observation method.

Ranging from 0.5 to 1.0 km, vertical resolution on the limb and obscuration sides generally is good. Horizontal resolution, ranging from 200 to 300 km, however, is poor. In observation of the bottom section of the sky, on the other hand, the horizontal resolution of approximately 10 km is good, but the vertical resolution ranging from 3 to 5 km does not quite measure up. (However, with respect to temperature and moisture, the troposphere has a resolution of approximately 1 km)

In addition to  $H_2O$ ,  $CO_2$ ,  $O_3$ ,  $CH_4$ ,  $N_2O$ , and  $CO$ , there are over twenty types of gases which can be measured, including  $HNO_3$ ,  $HCl$ ,  $SO_x$ ,  $OCS$ , and  $OH$  groups; and  $NO_x$ ,  $ClO_x$ ,  $HO_x$ , and  $ClONO_2$  which play important roles in the stratosphere ozone-layer destruction mechanisms.

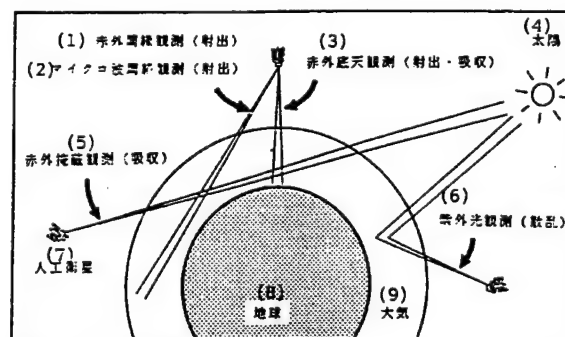


Figure 1. Conceptual Schematic Diagram of Measurement Method of Each Atmospheric Constituent

Key:—1. Infrared limb observation (emission)—2. Microwave limb observation (emission)—3. Infrared low sphere observation (emission and absorption)—4. Sun—5. Infrared sheltered observation (absorption)—6. Ultraviolet light observation—7. Artificial satellite—8. Earth—9. Atmosphere

### 3. Various Countries' Observation Plans

In the United States, in addition to launching of such utility satellites as the NOAA and the GOES, the EOS (Earth Observing System) project, aimed at launching a giant platform satellite on which a large number of sensors will be mounted, is being planned. This system is expected to play a central role in earth observations in the future. In Japan and Europe, observations from such orbital satellites as the ADEOS II and the E-POP, respectively, are being planned to coincide with the EOS project. (Recently, we received information that, because of budgetary constraints, the EOS project has been forced to take a drastic cut in funds, as a result of which, there is a good possibility that sensors will not be mounted on a single satellite but rather on several satellites to be launched.)

Table 2 [omitted] summarizes the infrared atmospheric sensors currently either scheduled or proposed for mounting. Of these the TES (U.S.), the MIPAS (Germany), and the SAFIRE (U.S.) are measuring devices which are very similar to the IMG. Researchers participating in the projects, last year, organized "Space FT-IR Workshop," ongoing research meetings aimed at the exchange of information concerning equipment involved as well as development of data analysis methods.

### 4. IMG/ADEOS

The ADEOS, which carries eight earth observation instruments, is a 3-ton class satellite launched by the H-II rocket. Its orbital altitude is approximately 800 km, and it requires 40 days to complete one revolution (semi-revolution, approximately 4 days).

The observation of the earth's atmosphere, using the IMG sensors mounted on this ADEOS, is being carried out as one segment of the Resource Energy Agency (MITI)'s Environmental Screening Survey (a survey on monitoring environmental effects covering extensive areas). Development of observation systems is assigned to the Organization for Development of Resource Exploration Observation Systems (a foundation) and that of data analysis systems to the Central Research Institute of Electric Power Industry (also a foundation). Furthermore, a committee to be served by experts from each field is being formed for each project so that specific tasks can be carried out. Members of the Environmental Impact Forecasting Departments are serving on these committees, primarily engaged in development of data analysis methodology.

Unlike the weather satellites, "Himawari" and "NOAA," which capture images of the earth, the IMG is a sounding sensor which measures bit by bit points alongside the orbit. The measuring interval is one of approximately 100 km, and the dimensions of one point is 8 km x 8 km. IMG is a so-called Michelson-type spectrometer, designed to measure infrared spectra of 714-3000  $\text{cm}^{-1}$  (wavelength approximately 3.3-14 microns) with a high wave number resolution of 0.1  $\text{cm}^{-1}$ . A skeletal diagram of its optical system is shown in

Figure 3. Of the gases which can be absorbed within the scope of this wave number,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{O}_3$ ,  $\text{CH}_4$ , and  $\text{CO}$  are considered amenable to measurement. Measurement is performed at each observation point at intervals of approximately every ten minutes and transmits interferograms (spectra transformed by the Fourier transformation) to a ground station. Normally, points observed are those directly below the satellite orbit on a vertical line; however, in order to meet emergency situations involving large-scale forest fires or volcanic eruptions, the kind of systems and operational modes which would enable sensors to concentrate on the observation of specific vicinities in such eventualities, currently is being investigated. The IMG's first experimental model, the BBM model, has been completed, and its performance tests are currently being conducted. Based on these performance results, future development of the EM, STM, and PFM models will be undertaken, with completion scheduled within a period of three years. As for the development of data analysis methods, with the data-simulation systems nearing completion, we have begun various types of testing.

### 5. Principle of Computing Gas Density Using IMG

After going through several processes, including sensitivity calibration, interferograms sent to ground stations are being converted into spectral data by reverse Fourier transformation.

When the FT-IR methods are used for the analysis of gases in a laboratory, employing the light absorption quantity obtained from a light source, it is possible to measure the density of gas contained inside a gas cell. However, when the earth is viewed from space, the situation becomes extremely complex in that temperatures of the earth surface portions constituting sources of

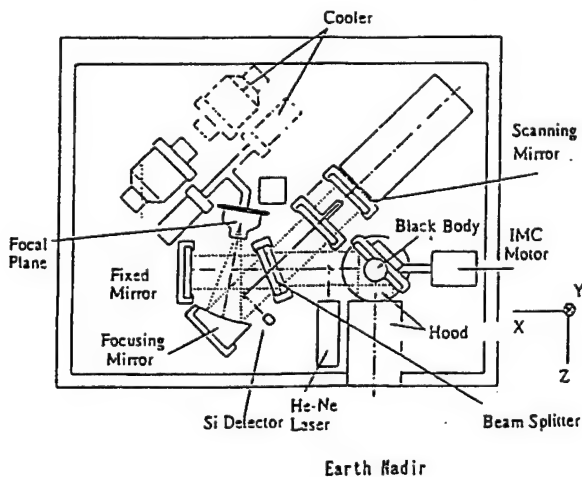


Figure 3. Sketchy Diagram of IMG's Optical System

light are unknown. Moreover, when atmospheric absorption of light is intense, it is not possible to see the earth surface as such but only light which is radiated from the atmosphere itself. Also, since density and air temperature have vertical distributions, they are not spatially uniform. Effects of atmospheric temperatures and pressures, and the density of absorbed gases play complex roles in the atmospheric radiation spectrum (radiance) as observed from the satellite. As a function of altitude, a certain distribution characteristic is a part and parcel of their existence. What we must know at the end of research is their vertical distribution properties. In order to obtain these, it is necessary that we be able to decipher the information received from the radiation spectra observed from the satellite. This is known as an inverse method, and the degree of precision associated with vertical distribution of various items of information obtained using this method depends to a large extent upon the inverse method's algorithms. Its theory is briefly touched upon in the following section.

First of all, the question of how vertical distribution of air temperatures can be obtained from spectral data provided in the sky. The solution is in the use of a summation function, expressing the atmospheric altitude at which the observed radiation of each wavelength contains the most information.

With methods thus far employed, using inverse characteristics, in order to obtain the concentration level of gases at a certain altitude, it will be necessary, first of all, to obtain atmospheric temperatures. In order to do so, the radiation amount in the  $\text{CO}_2$ 's absorption band had been used, upon the assumption that  $\text{CO}_2$ 's mixture ratio in the atmosphere is a known quantity. This is an extremely important problem for the IMG which must attempt to obtain the density of  $\text{CO}_2$ , which, of all the greenhouse effect gases, is considered especially important. It is theoretically feasible to obtain air temperature and  $\text{CO}_2$  density independently of one another by using multiple absorption bands. The question of the extent to which they can detect changes in concentration levels of  $\text{CO}_2$  in comparison with what can be delivered by the precision performance of the IMG is being examined, together with the development of algorithms themselves at the present stage.

In order to express the degree of high resolution obtained through the use of the inverse method to measure air temperatures and gas density, a device known as the resolution function is being used. This is a function which expresses the extent to which information concerning air temperature (density) is detected in the form of information.

## 6. Expected Results and Future Problems

The IMG is designed to last for three years after launching; however, this does not mean that it will be in full operation during the entire three years, since this will depend upon the lifespans of internal coolers, by the

restraints imposed by a data recorder, and by the satellite's data transmission capability. Its operational mode, therefore, consists of repetition of a work-rest cycle. At present, adoption of a specific preferable operational mode is under study. Regardless of the operational mode which eventually will be adopted, we believe that the following data will be obtained concerning air temperatures and various gas concentration levels as the ultimate results generated by the IMG:

First of all, in the troposphere (earth surface—at an altitude approximately 10 km), once every four days at a high resolution of approximately 1-2 km, and in the horizontal direction, at every grid of approximately 100 km x 35 km, at the ratio of one point, data will be obtained (according to the standing estimate of 41 days required for one revolution, approximately 100 km x 35 km). In the case of the troposphere, since it is not possible to measure it if clouds should appear, we assume that if one out of every three observation days is clear, then, at the rate of approximately once every twelve days, we will be able to obtain entire global data. However, around the equatorial region, where clouds are always present, the speed of observation will drop somewhat. On the other hand, in the stratosphere (at altitude approximately 10-40 km), absence of clouds will make it possible to obtain the entire global distribution of air temperatures and gas density of ( $\text{H}_2$ ,  $\text{O}_3$ , and  $\text{N}_2$ ) at a frequency level of once every four days. High resolution at that time will be around 3-5 km, and data volume in the horizontal direction is about the same as the one associated with troposphere.

By using these data, in combination with wind data obtained from the observation network of the Meteorological Bureau, we will be able to obtain an important clue to elucidation of the volume of global greenhouse effect material being transported and their circulation mechanisms. Many researchers have estimated the global distribution of greenhouse effect substances and the mechanisms of their transport by using observation methods from the ground and by air as well as by conducting modeling experiments.

Moreover, since the IMG covers a fairly wide wavelength zone of the infrared radiation, its data is useful in monitoring the quantity of important longwave radiation when atmospheric energy balance is taken into consideration. Moreover, as validation of the greenhouse effect, itself, the IMG data will be useful also in monitoring temperature changes in the stratosphere which is considered a more sensitive index. We believe, therefore, that we will be able to obtain important data in terms of atmospheric chemistry and atmospheric radiology.

In achieving the results described above, we are going to face many problems which must be resolved at the earliest dates possible in the future. Although developments in the observation systems are progressing smoothly, many problems still remain unsolved in the development of data analysis methods. Chief among them are (1) integrated systematization of individual



data analysis systems; (2) development of a method for removing cloud effects in the inverse system; and (3) investigation of the feasibility of measuring CO<sub>2</sub> concentration levels. All of these problems should be resolved by the time launching of the satellite takes place. Vigorous R&D efforts in this field on a continuing basis will be essential, therefore.

### **The Role Of Living Organisms in the North Pacific's Carbon Cycle: Research In The Hakurei-Marui And Satellite Remote Sensing**

#### **Introduction**

Approximately one-half of the carbon dioxide released by human beings remains in the atmosphere. What will become of the other half, however, is not clear, although some suggest its absorption by ocean. As a matter of fact, sea water does contain a large amount of carbon, and an active exchange between surface of the sea and the atmosphere is taking place. The total amounts of its absorption and emission of carbon dioxide are said to be greater by as much as one digit than those emitted by human beings. Since carbon dioxide concentration levels are constantly fluctuating both spatially and time-wise, it would not be easy to estimate the average amount of CO<sub>2</sub> absorption and emission on a global basis.

Recently, activities of biotic communities living in ocean surface waters began to attract attention as a process which, possibly, may be affecting the amounts of the ocean's CO<sub>2</sub> absorption and its emissions of carbon dioxide, both spatially and timewise. Carbon dioxide molecules, with the ability to interact with the atmosphere on the sea surface, are dissociated in the water and coexist with carbon and bicarbonate ions. Using solar light and nutrient salt, photoplanktons which live in sea water convert the inorganic carbon into an organic material with which to build their body and into an inorganic material with which to build their shells. The carbon which has been transformed into a photoplankton state will be transformed into zooplanktons, fish, and bacteria by passing through the so-called food network. In the course of this process, a portion of the carbon will have become either a granule material, heavier than sea water, thus sinking to the bottom of the sea, or a soluble organic material, thus diffusing into the water. This latter process, known as a "biological pump," is extremely important one in considering the ocean's carbon cycle. The question of to what extent and in what form carbon will be removed from the surface layer of the ocean is dependent upon the differences among ecosystems existing on that layer, namely, what varying types of biotic communities are making up the ecosystem. Needless to say, it is extremely important to understand the bioprocess involved in order to understand the oceanic carbon cycle. In this lecture, I should like to introduce our research work in which we used our oceanographic survey ship, the Hakurei-marui, and the satellite remote sensing technology.

### **Survey And Research Conducted Aboard The Hakurei-Marui**

In cooperation with the New Energy and Industrial Technology Development Organization and others from academic circles, investigative research into the carbon cycle began aboard the oceanographic survey ship in 1990. During the period, August 22, 1990-October 10, 1990, we had investigated the 175-degree east latitude, approximately near the center of the Pacific extending from a point located at 45 degrees north latitude to one at 8 degrees south latitude, measuring the quantities of all different types of carbon compounds found within 300 m of the surface layer, including various ecosystems, gaining an understanding of the physical structure of the ocean and analyzing nutrient salts. (Figure 2)

The partial pressure of CO<sub>2</sub> in the atmosphere along the 175 degree parallel line on the east latitude remains nearly constant at 350 ppm; however, the partial pressure of CO<sub>2</sub> in the sea water surfaces vary from 300 to 390 ppm. South of the 38th parallel in the North Latitude, the partial pressure of CO<sub>2</sub> in sea water is higher than that of the atmosphere at many other points, with the ocean serving as a zone into which CO<sub>2</sub> is released. North of the 175th parallel line of the northern latitude, on the other hand, the sea is absorbing CO<sub>2</sub>. Although the partial pressure of CO<sub>2</sub> in terms of the first principle has good correlation with water temperatures, in the vicinity of the equator, where water temperature is constant, it has a correlation with salinity. Chlorophylls, which show concentration levels of zooplankton in most cases, have an inverse correlation with water temperature. In the northern region where a large quantity of chlorophylls is present, there are oceanic areas where the partial pressure of CO<sub>2</sub> exhibits an inverse correlation with chlorophyll, suggesting the possibility of effects of bioactivities. Moreover, total carbon density in the water has good correlation with quantities of nutrient salts, exhibiting a distribution characteristic which increases as the ocean depth increases, at least on the surface layer. This is an indication of the "biological pump" at work. The subtropical region north of the northern latitude at 36 degrees and the equatorial region south of the northern latitude at 10 degrees have larger quantities of both chlorophylls and nutrient salts in comparison with those found in the subtropical cycle regions located inbetween the two regions. However, while the size of chlorophylls (the size of photoplanktons) in the subtropical region ranges from 3 to 20 microns, which is relatively large, in the equatorial region, as it is in the subtropical region, there are a greater number of small-size plants (sized less than 3 microns). Especially in the southern region, existence of many primeval green algae cells has been confirmed. The question of how the size and composition of these photoplanktons affect the carbon cycle will be the subject of future research.

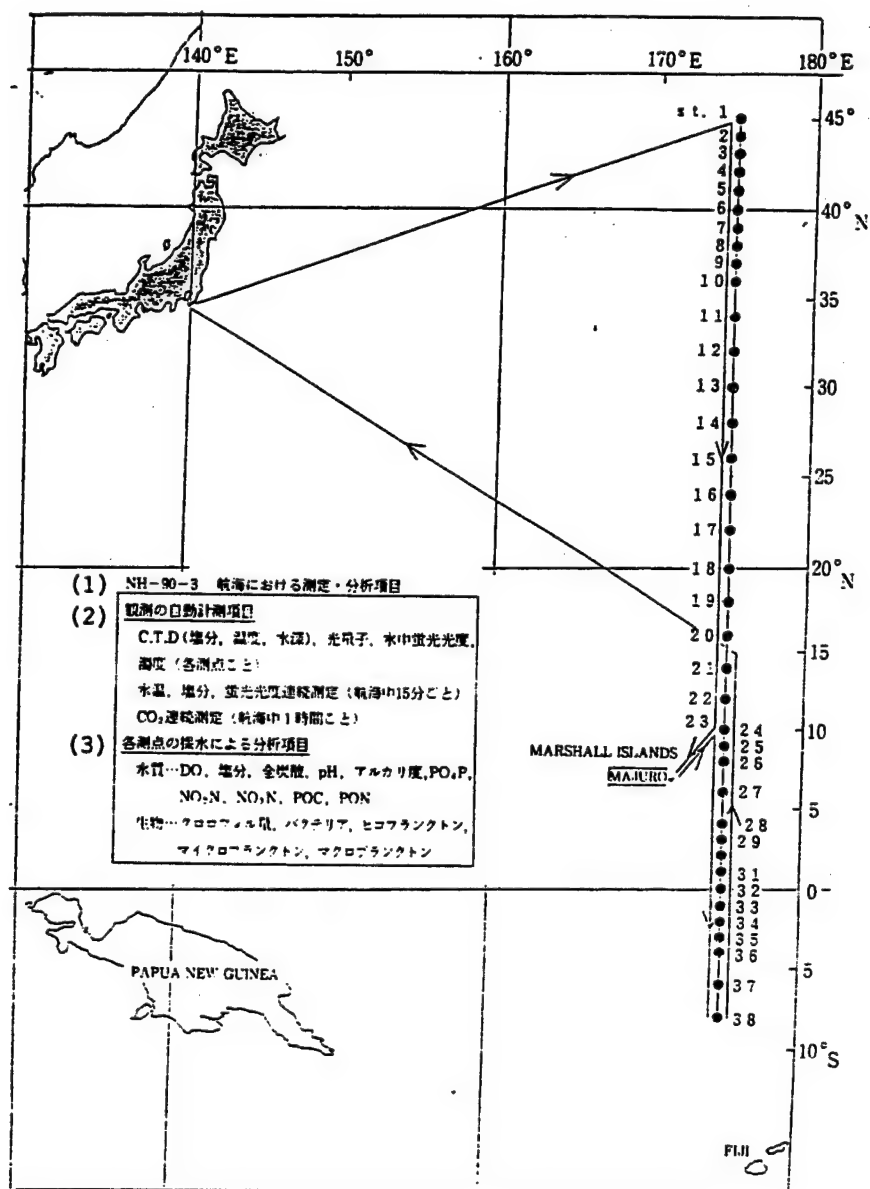


Figure 2. Ship's Route and Points of Investigation Conducted by the Hakurei-Marui at the 175 Degree Parallel line in 1990

Key:—1. NH-90-3 Categories of Items for Measurement and Analysis During Voyage—2. Categories of observation items for automatic measurement: C.T.C.(salinity, temperature, depth of water), photon, underwater fluorescent light intensity, turbidity (at each point of measurement); water temperature, salinity, continuous measurement of fluorescent light intensity (every 15 minutes during voyage); continuous measurement of CO<sub>2</sub>(every hour during the voyage)—3. Categories of Items for Analysis Using Water Sampling at Each Measuring Point: water quality—DO, salinity, total carbon dioxide, pH, alkali level; Organisms—chlorophyll quantity, bacteria, [picoplankton], microplankton, macroplankton

At this time, we have gone no further than measuring the main carbon compounds present, including those of living organisms. It will be essential, therefore, to ascertain the speed with which carbon will travel among organisms and carbon compounds. Furthermore, we must determine to what extent the carbon cycle will change for every season and every year.

#### **Research Conducted With Use of Satellite Remote Sensing**

In carrying out research on the role which organism played in the oceanic carbon cycle, we found the severe limitations imposed on the movement of the observation ship, in terms of scope and time, the most difficult problems with which to contend. In order to acquire information contained in the vast ocean, therefore, the most effective method was to use the satellite remote sensing technology. The research project which uses this technology also has been undertaken. In the course of research designed to determine the role of living organisms in the carbon cycle, it is necessary to control the changes in phytoplanktons in terms of time and space. From 1978 to 1988, a sensor designed to measure the color of the sea (CZCS) was placed aboard the satellite, NIMBUS-7. Use of this sensor enables scientists to measure with high frequency chlorophylls living in the surface of the sea water. The question of the extent to which data obtained by this sensor can be adapted quantitatively to Northwest Pacific conditions is currently being studied. Already, the ways in which phytoplanktons are being greatly changed by the factors of time and space is being captured qualitatively. In 1993, the United States, and, in 1996, Japan are scheduled to launch similar sensors, viz., the SeaWiFS and the OCT, respectively. By then, it will be necessary not only to combine the data obtained from the ship but also the satellite data as well so that the required analysis can be conducted using a carbon cycle model.

#### **Effective Use of Biomass**

##### **1. Introduction**

Biomass is defined as an aggregation of living entities like trees, grass, or algae. For the great concern expressed worldwide for the serious effects of global warming caused by carbon dioxide's greenhouse effects, the biomass offers the potential of becoming the solution to this problem.

Fossil fuels, such as coal and petroleum oil, inevitably turn into carbon dioxide when combustion takes place. It has been said that, since the Industrial Revolution, the consumption of fossil fuels has doubled concentration levels of carbon dioxide in the atmosphere. In order to deal with this problem, the research and development of technologies designed to use such alternative energies as nuclear power, solar light, solar heat, wave power, tidal force, wind power, geothermal sources, and the biomass have been actively pursued. Especially since the "Oil Shock," development of these new forms of energy has

been receiving enthusiastic government support under the provision of national projects.

All alternative energies (including nuclear power), with the exception of biomass, can generate electric energy; however, unlike fossil fuels, they cannot create liquid fuels, such as gasoline, and such chemical materials as alcohol. Biomass, on the other hand, can be converted into chemical materials and fuels. Moreover, biomass has the capacity to fix carbon dioxide in the atmosphere. Even when used as a fuel, it does not increase the carbon dioxide in the atmosphere. Development of a technology designed to use biomass cleverly, making the most of its favorable characteristics is strongly desired.

During the past ten years, our group has been conducting research on a technology designed to produce oil directly from biomass. This technology is aiming at thermochemically converting biomass, viz., wood and organic wastes, into oily substance. This technology can be applied to the creation of new alternative fuels or to waste treatment. Today, I should like to report on the present state and future prospects of this technology, with a focus on the conversion of biomass into oily substances.

##### **2. Availability of Biomass**

Fixating carbon by the earth's biomass is being carried out, both on land and at sea. While the quantity of fixed carbon on land is approximately 50.1 billion tons, fixing approximately one half of that amount, a total of about 750 billion tons, occurs at sea. Of the 750 billion tons of carbon existing in the atmosphere in the form of carbon dioxide, approximately one-tenth, 73 billion tons, are produced as biomass. When this number is converted into the amount of heat generated, it is equivalent to approximately 10 times the amount of primary energy currently consumed by the world<sup>1)</sup>. Consequently, we no longer will have to depend on fossil fuels or nuclear power, as the energy needs of the world can be met by the net production volume of biomass energy alone.

However, realistically speaking, marine plants and phytoplanktons have low energy density. With present technology, it would be impossible to utilize them in large quantities as an energy source. Moreover, for the same reason, it would not be possible to use these grasses as energy sources on land. There will be social restrictions on the processing of biomass materials primarily used as food for the purpose of obtaining energy. Consequently, wood will provide the most promising use of biomass for energy.

Although the priority uses of woods would be for procurement of construction and pulp materials, quantitatively, they are exactly the kind of biomass easy to secure as an energy source. The advantage of this approach is that woods are not seasonal and very few problems are associated with their use, although their quality is somewhat inferior. There is a report that essentially the usable amount is no more than 10% of the lumber resources, but these problems should be resolved through the



means of improved afforestation technology, biotechnological advances, and innovation in conversion technology. It will be important to restrain, at all costs, use of any resource sources which are likely to run out sooner or later, and to replace them with biomass resources.

### 3. Usage Technology

Historically, prior to use of coal, namely, in the pre-industrial revolution world, its principal source of energy were firewood and charcoal. Today, however, the firewood and charcoal fuels represent mere one-thirtieth of the total energy consumed, with areas of consumption being mostly developing nations of Asia, Africa, and South America.

At present, biomass energy constitutes approximately 10% of the world's total primary energy consumed. In the United States, biomass through direct combustion supplies approximately 5% of the total energy being used. According to the National Wood Energy Association (NEWA)<sup>4</sup>, of the amount of biomass energy now used in America (1.35 billion tons), approximately 10% is in the form of electric power. Its raw materials mainly consist of scrap wood and urban and agricultural waste matters.

They supply approximately 5100 MW energy; however, the potential supply capacity is considered far greater. According to the NWEA, the consumption-oriented United States annually is producing biomass residuals exceeding some 2 billion tons. This is sufficient to produce 200,000 MW energy; in other words, it produces an amount of energy equivalent to the output of 200 nuclear plants. According to the estimate of the U.S. Forestry Agency, of the biomass residuals created yearly, approximately 40% can be recovered.

After wood has been processed at approximately 900°C, a mixture of methane, hydrogen, and carbon monoxide is produced, a process known as gasification. Gasoline can be produced by processing this mixture, using a method called the Fischer-Tropsch process. From the same gas mixture, methanol also can be manufactured. Moreover, recently, research in a method of manufacturing liquid fuel directly from wood and sludge is being conducted at our research institute. Details are given in the following sections<sup>6,7</sup>.

In addition to the thermochemical conversion processing, there are forms of biochemical processing such as alcoholic fermentation and methane fermentation methods. Although alcoholic fermentation is a technique existing since the ancient times, recent technical innovations have produced a more efficient version of this technology. Especially in Brazil, approximately 10 million cubic meters of ethanol are being produced yearly from sugar canes. Also in the United States, around 3 million cubic meters of fuel ethanol are being produced yearly from corn. In comparison with such a biochemical process as alcohol fermentation, which has a long history, most of the thermochemical processes, in general, have yet to be fully developed. However, the technology,

even at this stage of development, has a large-volume processing capability and is characterized by short reaction time. Because of its technical potential, its future outlook is bright.

### 4. Overview of Oilification Technology

This is a technology designed to convert organic materials into oily substances using thermochemical reactions. Another technology similar to this is thermal decomposition. As you will see from Table 1 that there is a big difference in the operational requirements of the two. As for their reaction temperatures, in comparison with those required in oilification, viz., 250-300°C, the thermal decomposition technique requires somewhat higher temperatures, viz., 400-500°C. As for operation pressure, while the thermal decomposition process is operated under normal pressures, the oilification process requires high pressure conditions, viz., 50-100kg/cm<sup>2</sup>. From the standpoint of equipment design requirements, thermal decomposition is a better choice. However, oilification process can handle materials with a water content of 70-80% without preprocessing raw materials, whereas thermal decomposition process restricts water content to 0-5%, requiring pretreatment for removal of water content. Since a large volume of energy will be consumed in the course of this pretreatment, from the standpoint of total processing costs, if a material has a high water content, it would be more economical to select oilification process.

**Table 1. Comparison of Thermal Decomposition and Oilification Processes**

Process	Operating Pressure	Operating Pressure	Dry Process
Thermal Decomposition	300-400°C	Normal pressure (1-5 kg/cm <sup>2</sup> )	Required
Oilification process	250-350°C	High pressure (50-200 kg/cm <sup>2</sup> )	Not required

The characteristics of this method are as follows:

- (1) Oilification process does not require reductive gases such as hydrogen, carbon monoxide, and synthesized gases;
- (2) Since reactions can proceed in the H<sub>2</sub>O phase, generally-speaking, dehydration and drying processes will not be necessary; and
- (3) If wood serves as a raw material, since it contains only small quantities of sulphur, nitrogen, and heavy metals, clean liquid fuel will be produced.

Unlike a method employed by the U.S. Bureau of Mines since the 1960s for the purpose of producing liquid fuels from cellulose materials using a synthetic gas, our method does not require deoxidization gas; therefore, in our opinion, it offers excellent economy and safety. With this method, when a raw material and an alkali aqueous

solution are mixed and heated, high pressure is generated by saturated vapors of water. For instance, at 300°C, the water's steam pressure reaches approximately 90 atm. Three application examples of this method are shown below:

#### 4.1. Oilification of wood

Selecting konara [phonetic] wood powder as a raw material and using potassium carbonate as a catalyst, we conducted an experiment of converting wood into an oily substance using a small autoclave. We examined relationships between the optimal reaction conditions, viz. initial pressure, the reaction temperature, the residence time, and the wood-powder/catalysis, and yield efficiency.

We varied the quantity of potassium carbonate, a catalyst, within the scope of 2-40 wt%; the resulting yield, ranging from 20 to 25%, indicates that an increase in the amount of the catalyst did not have much effect. When optimal conditions were combined, viz., initial pressure 20 atm, reaction temperature at 300°C, residence time, 0 minute, and the quantity of catalyst used 4 wt%, the yield reached 47.6%.

Experiments using different types of trees, other than konara, were conducted and their results summarized. We used broadleaf trees consisting of a Japanese poplar and a Japanese beech; needleleaf trees, a Japanese cedar, a Japanese hemlock, spruce, a Japanese larch, and a Japanese red pine; and tropical woods, the auan, kapuru [phonetic], kamerere [phonetic], and silver fur. We produced oil from their bark and compared yields. Although the yield from the Japanese red pine was somewhat lower, on the whole differences were relatively minor, most of them falling into the range of 40-50%. The fact that differences in the kind of trees used has very little impact on the amount of oil produced means that a large variety of wood can be utilized and that selection will not be a factor.

However, the type of oil produced using wood as a raw material has low fluidity, which poses the problem of handling. In our attempt to solve this, we have added organic solvent to the reaction system. From this experiment, we were able to gain some interesting insights.

#### 4.2. Oilification of Sewage Sludge

The objective of using sewage sludge in producing oily substances is to carry out the sludge disposal operation without relying on an outside energy supply. Sludge released from sewage disposal plants is turned into oily matters so that they can be used as an energy source for the oilification operation.

The dehydrated sludge mixture used in the experiment has water contents of 75%, organic matter ratio of 84%, and heat generation of 4,900 kcal per kg. While the main components of wood were holocellulose and lignin, the sewage sludge characteristically contained protein, fat, and nitrogenless soluble matter (carbohydrate). We

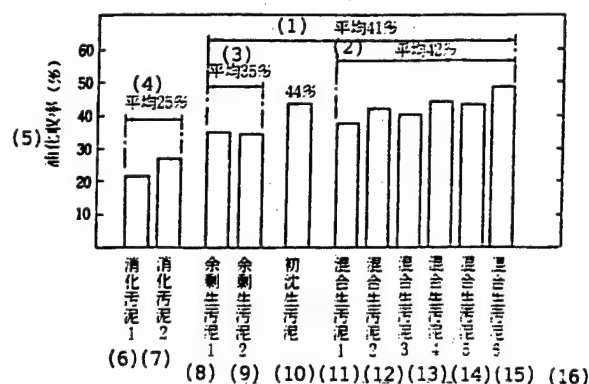


Figure 4. Relationship Between Type of Sewage Sludge and Oily Substance Yielded

Key:—1.,2.,3.,4. Average—5. Yield of oilification process—6.,7. Digested sludge—8.,9. Excess raw sludge—10. Initially settled raw sludge—11.,12.,13.,14.,15.,16. Mixed raw sludge

examined the relationships among reaction temperature, operational pressures, residence time, the ratio of catalytic addition, and oilification yield. When an oilification reaction was conducted under optimal conditions, we were able to obtain oily matters at the ratio of 50% of the organic substance contained in the sludge. This indicates that approximately 70% of the sludge's energy can be recovered as oily matter. Moreover, it was indicated that the process of oilification of sludge must be an autonomous process.

Depending upon the type of treatment carried out, sewage sludge can be classified into the initial raw sludge settled at bottom, excess raw sludge, mixed raw sludge, and digested sludge. As shown in the above figure, the digested sludge's yield of oil substance is lower than that of other types, making it clear that it is not suitable for the oilification process. However, raw sludge is a different story altogether. At present, under bench-mark scale provisions, continuous operation is being carried out at a stable pace for oilification raw sludge.

#### 4.3. Oilification of Alcohol Distillation Residuals

The residuals are released in the course of alcohol manufacturing process which uses a fermentation method, and we are racking our brains in order to find ways of disposing them. We have experimented with oilification reactions using the so-called alcohol distillation residuals as a raw material, the results of which are as follows. First of all, after water contents of rice distilled spirits residuals were reduced to 74% by a dehydration process, they were converted into an oily substance using a reaction temperature of 300°C, with operational pressure of 120 atm, and with a 10% addition of sodium carbonate. This resulted in 50% yield of oily substance with a calorific power of approximately

8,400 kcal. In addition, we have tested the oilification reactions, using the distillation residuals released during the manufacturing process of the potato and wheat distillation spirits.

With respect to distillation residuals, in the countries (Japan and others) where ethanol is actively used as an alternative fuel replacing petroleum, huge amounts of distillation residuals are being released, creating expectations of new processing technologies. Especially in Brazil, where approximately 100 million kl of alcohol (100% conversion) is manufactured; consequently, the distillation residuals released will become thirteen- to fourteen-times as much as before. If the distillation residuals, discharged from the alcohol manufacturing process, can be converted into oily substances by the oilification reaction, not only would this prevent environmental pollution but it also would make a substantial contribution to energy savings.

### 5. Future Prospects

In order for these oilification technologies to become usable in practical applications, several technical problems must be solved. It is essential that we attack and overcome the barriers created by these problems. Practical application of these technologies, nevertheless, are making steady progress in the areas of alcohol distillation and waste disposal. From the standpoint of creating new energy, the technologies are creating expectations for the future. For instance, by planting trees in the areas which will turn into deserts if left alone, we can prevent this desertification process from occurring; and, at the same time, consider the development of a system which combines this technology with biomass usage technology.

At the present juncture, the annual growth of eucalyptus trees is at the rate of 40m<sup>3</sup>/ha. It no longer will be a dream to realize a system which can produce a combination of fast growing trees and the agricultural product, such as sugar canes, freeing us from total dependency on fossil fuels for energy.

There is a proposal for bringing sea water into the desert and building a huge pool so that algae may be cultivated. Some types of algae produce both hydrogen and hydrocarbon using solar light, and a great deal of expectations, therefore, are generated for biomass as an energy source for the future. With respect to biomass, there is a strong possibility of a series of new technologies, such as an improved variety, being developed using genetic engineering.

To construct this biomass industry, which will manufacture bio fuels, petrochemical products, and medical and pharmaceutical products through biomass afforestation or cultivation, will mean new business development and the curbing of carbon dioxide emissions in the atmosphere caused by fossil resources, as the biomass has the capability of fixing atmospheric carbon dioxide inside its own cells at high rate. Construction of a self-sufficient production system by developing such biomass plantations in the areas where

desertification had deemed inevitable will contribute to the solution of the problem of South vs. North as well as to international cooperation.

### Bibliography

- 1) J. Honda : Biomass Energy, p. 3. Energy Saving Center (1986).
- 2) Hiroshi Kubota and Satoshi Matsuda : Energy and Resources, 4. 103 (1983).
- 3) Overseas Information on New Energy. no. 9, p. 40 NEDO (1989).
- 4) Ibid. No. 6, p. 1, NEDO (1990).
- 5) Ibid. No. 9, p. 79. NEDO (1989).
- 6) Tomoko Ogi, Shinya Yokoyama, and Katsuya Oguchi : Sunshine Journal, 7 (4), 28 (1986).
- 7) Shinya Yokoyama : Industrial Pollution, 26 (7), 12 (1990).

### Techniques for Decomposition of CFC (Chlorofluorocarbon)

#### 1. Introduction

The CFC issue began with its destruction of the stratosphere's ozone layer. However, according to the IPCC's assessment panel report, with the exception of halon, trichloroethane, and carbon tetrachloride, which are also involved in the ozone layer issue, CFC is a chemical substance which also is responsible, in part, for creating the problem of global warming.

When technical measures for dealing with the existing type of "pollution" problem are categorized, evolving around polluting equipment (production process, combustion machine), we have come up with the following:

- (1) input control;
- (2) internal control; and
- (3) output control.

In some cases, it still is possible to put together technical solutions for today's global environmental problems along these lines. Although I will not go into detail at this point, let me provide you at least with one example of this.

The reasons why CFC came to the fore in discussing measures for dealing with the global warming issue are as follows:

- (1) During the period, 1980-1990, among the substances responsible for global warming, CFC was second, in terms of quantity in the atmosphere, viz., 24%, after CO<sub>2</sub> (55%). Moreover, of the four substances, which include methane and N<sub>2</sub>, CFC has the highest annual rate of increase and is predicted to be closing in on CO<sub>2</sub> within the very near future;

(2) Since its source of origin can be easily identified, writing a scenario for solving the problem it presents is easy;

(3) Since the amount generated annually is no more than 1 million tons, which is considerably smaller than those of three other substances—in the case of CO<sub>2</sub> 25 billion tons—any measures taken will have substantial impact.

(4) CFC was invented only sixty years ago. Consequently, the short history of CFC equipment will make it more receptive to change.

Measures for dealing with the CFC problem can be divided into (1) replacement technology (substitute substance and process), (2) recovery and reuse, (3) destruction of CFC, and (4) streamlining its use. In this presentation, I should like to cover the technology designed to destroy the CFC, a substance responsible for the destruction of the stratosphere ozone layer and creation of global warming.

## 2. Meaning of CFC Destruction Technology

The CFC treatment technology, which deals with pollutant output control, largely can be divided into (1) recovery and reuse and (2) destruction (decomposition). The former is concerned with a method for the separation and concentration of CFC in waste liquids and exhaust gases. It is applied to cold coagulation, adsorption, and absorption technologies. The methods of recovery and reuse designed to curb production and effectively use the precious CFC is a meaningful way of solving the problem. However, since CFC waste contains various coexistent substances, technically and economically, it is difficult to refine and to produce a pure CFC substance. It often is easier to curb its emission into the atmosphere by using the latter destruction technology. Moreover, reuse of HF and other fluorines as synthetic raw materials of new fluorine compounds is a possibility. For instance, we are considering their use in synthesizing CFC replacement substances, namely, hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon, since the use of CFC itself will have been totally abolished by the year 2000.

In terms of system, "destruction volume" and "conversion to useful substance volume" will be subtracted from the "CFC production volume" and "actual production figure" whose reduction is mandated by the Montreal Agreement. Development of an internationally recognized destruction method, therefore, will become extremely urgent, and this important problem must be dealt with immediately.

One of the characteristics of CFC is that it is a thermochemically stable chemical substance; hence, its decomposition, in comparison with that of hydrocarbon, is considerably more difficult to achieve. Moreover, since until today, there had been no need for the decomposition of CFC, hardly any research work had been undertaken in this field. To accomplish inversion of CFC, the following means may be considered: (1) decomposition

of CFC into its components to recover original raw material elements, such as hydrogen chloride and hydrogen fluoride (complete destruction) and (2) synthesis of polymers, such as substitute CFC and teflon, using CFC as a raw material.

## 3. Chemical Reactivity of CFC

Table 1 shows such material parameters as carbon bond energy, of H, F, Cl, and Br atoms. Of all atoms, the F atom has the largest electronegativity, producing a strong C-F bond. Moreover, the der Waals radius of the F atom is 10% larger than that of the H atom, hence provides stereochemical conditions which will allow replacement of all H atoms in hydrocarbons. It is possible, therefore, to have a structure in which molecules are covered by a "fluorine sheath." Contrary to such strong inner molecular bonding force, interactions between molecules are markedly weak. Because of this, fluorocarbon is characterized by a relatively low boiling point in spite of its molecular weight, and it is thermochemically a stable substance.

**Table 1. Various Characteristics of Halogen and Hydrogen Atoms**

	H	F	Cl	Br
van del Waals radius (nm)	1.20	1.47	1.75	1.85
Electronegativity (Pauling)	2.1	4.0	3.0	2.8
C-X Bond Radius	1.07-1.11	1.30-1.38	1.64-1.77	1.79-1.94
C-X Bond (CH <sub>3</sub> -X) Energy(kJ mol <sup>-1</sup> )	434	452	345	291

Although CFC is a compound in which part of the F atoms are replaced by Cl atoms so that its lipophilic property can be enhanced when the boiling point is raised, it has a residual effect of F atoms, maintaining characteristics of the fluorocarbon mentioned above. As for the methane system's halocarbon, the energy required in bonding and dissociation of C and X (X denotes halogen) is summarized in Table 2. The C-F bond is more difficult to dissociate than the C-Cl bond; moreover, the more Cl atoms are replaced by F atoms, the stronger the C-F bond and the C-Cl bond will be.

**Table 2. Halocarbon's Bonding and Dissociation Energy**

	Bonding and Dissociation Energy/kJ mol <sup>-2</sup>	
	C-Cl	C-F
CCl <sub>4</sub>	305.9 plus/minus 7.5	—
CCl <sub>3</sub> F	305 plus/minus 8	427 plus/minus 9
CCl <sub>2</sub> F <sub>2</sub>	318 plus/minus 8	460 plus/minus 25
CClF <sub>3</sub>	360.2 plus/minus 3.3	490 plus/minus 25
CF <sub>4</sub>	—	542 plus/minus 4



Using CFC-11 a( $\text{CCl}_2\text{F}$ ) as an example, we show in Table 3<sup>1X</sup> thermodynamic parameters, viz., equilibrium constant ( $K_p$ ), and entropy change ( $\Delta H^\circ$ ). Even if we decompose the CFC and attempt thereby to obtain carbon (C),  $\text{Cl}_2$ , and  $\text{ClF}$ , because of the markedly small  $K_p$  value, reaction, in reality, will not take place. However, by establishing a reaction formula to which a second substance, selecting  $\text{H}_2\text{O}$ ,  $\text{O}_2$ , or  $\text{H}_2$  is added, we do obtain large  $K_p$  values in all cases, which indicate that it is possible to have continuous reactions. Moreover, any of these reactions changes the  $\Delta H^\circ$  value to a negative one, resulting in an exothermic reaction. Side reactions involving CFC which require our attention are the disproportionation reaction, in which F and Cl are

exchanged between two-molecule CFCs, and the carbonylation reaction which acquires  $\text{COCIF}$ , a compound similar to phosgene. It is conjectured that the dimerization reaction of  $\text{C}_2\text{Cl}_4$  and the cyclization reaction of  $\text{C}_6\text{F}_6$  will proceed readily at high temperatures. Moreover, an increase in the carbon number of the organic halogen compound results in a geometric increase of similar kinds of compounds. Unfortunately, the thermodynamic data required for computation of free energy used in producing such compounds at present are not available. Future problems requiring our attention, therefore, include calculation of the temperature dependency of the  $K_p$  values of a large number of substances, such as chlorobenzene, not listed in Table 4, and the observation data.

**Table 3. Thermodynamic Parameters of CFC-11 Decomposition Reaction**

Reaction Formula	$\log K_p$	Entropy Change $\Delta H^\circ \text{KJ}(\text{mol-CCl}_3\text{F})^{-1}$
$\text{CCl}_3\text{F}=\text{C}+\text{Cl}_2+\text{ClF}$	-64.49	938.22 (endothermic)
$\text{COI}_3\text{F}+4\text{H}_2=\text{CH}_4+3\text{HCl}+\text{HF}$	28.13	-346.94 (exothermic)
$\text{CCl}_3\text{F}+2\text{H}_2\text{O}=\text{CO}_2+3\text{HCl}+\text{HF}$	19.56	-181.88 (exothermic)
$\text{CCl}_3\text{F}+\text{O}_3=\text{CO}_2+\text{Cl}_2+\text{ClF}$	16.07	-172.00 (exothermic)
$2\text{CCl}_3\text{F}+4\text{CaO}=2\text{CO}_2+3\text{CaCl}_2+\text{CaF}_2$	198.58	-1303.35 (exothermic)

Calculated at 300K

**Table 4. Byproduct of Decomposition of CFC-11**

Reaction Formula	$\log K_p$			
	300K	1000K	1500K	6000K
Disproportionation reaction- $2\text{CCl}_3\text{F}=\text{CCl}_2\text{F}_2+\text{CCl}_4$	1.32	0.07	-0.11	-0.38
Demerization Reaction- $2\text{CCl}_3\text{F}=\text{C}_2\text{Cl}_4$	-72.51	-15.97	-6.22	4.09
Cyclic Reaction- $6\text{CCl}_3\text{F}=\text{C}_6\text{F}_6+9\text{Cl}_2$	-599.16	79.97	-7.65	
Carbonylation Reaction- $\text{CCl}_3\text{F}+\text{H}_2\text{O}=\text{COCIF}+2\text{HCl}$	24.08	12.65	10.95	
Carbonylation Reaction- $\text{CCl}_3\text{F}+0.5\text{O}_2=\text{COCIF}+\text{Cl}_2$	30.67	12.19	9.46	

#### 4. Complete Destruction

CFC decomposition technology currently under research and development in our country is summarized in Table 5. Major decomposition techniques are described below.

##### 4.1. Combustion-Decomposition Method

The combustion-decomposition method is designed to accomplish decomposition of CFC, using heat generated internally by the combustion of petroleum-type fuels or inside external-heat-combustion equipment. Thermal decomposition of CFC requires  $700^\circ\text{C}$  plus heat. There is a report<sup>33)</sup> on the decomposition of the most representative of the hazardous organic waste liquids containing toluene 90%, CFC-113 2.5%, carbon tetrachloride 2.5%, chlorobenzene 2.5%, and trichloroethylene 2.5% at 2.0 second residence time; the report studied their decomposition characteristics by varying such combustion conditions as decomposition temperature and excess oxygen ratio. As shown in Table 6, while the decomposition rate of benzene, chlorobenzene, and trichloroethylene improved with an increase in the amount of

oxygen, decomposition of CFC-113 and carbon tetrachloride were not affected by the amount of oxygen. In the case of CFC-113, the temperature which delivered 99% decomposition ratio was  $780^\circ\text{C}$ . However, when this mixed liquid was decomposed at temperatures ranging from  $650^\circ\text{C}$  to  $750^\circ\text{C}$ , very small amounts of the total of approximately 58 kinds of organic halogen compounds, including fluorobenzene, were formed. Although a large part of the excess oxygen was eliminated at  $850^\circ\text{C}$ , if oxygen was absent, the organic halogen compound was detectable even at a temperature of  $1000^\circ\text{C}$ .

Examination of thermal decomposition by means of CFC/hexan/air using the equipment whose flowchart appears in Figure 4, has been reported in Japan<sup>4)</sup>. Although it was reported in the past that in the case of CFC-112, 99% decomposition is possible at a temperature of  $765^\circ\text{C}$ , this method produces CFC-12 as a byproduct. In order to decompose the byproduct, a decomposition temperature higher than  $820^\circ\text{C}$  is required.



- |  |   |
|--|---|
| 1. Incineration/Thermal Decomp.:           | National Research Institute for Pollution and Resources,<br>National Chemical Laboratory for Industry |
| 2. Thermal Plasma:                         | National Research Institute for Pollution and Resources<br>Tokyo Institute of Technology              |
| 3. Catalysis:                              | National Research Institute for Pollution and Resources<br>TOSOH Corporation<br>Kyushu University     |
| (Conversion)                               | Kyoto Institute of Technology<br>Hokkaido University<br>Tokyo Institute of Technology                 |
| 4. Organic Reagent:                        | Kyoto Institute of Technology<br>Okayama Sanitation Center  |
| 5. Supercritical Water:                    | National Chemical Laboratory for Industry   |
| 6. Photochemistry:                         | National Chemical Laboratory for Industry<br>Hokkaido University<br>Toshiba Corp.                     |
| 7. $\gamma$ -Ray Irradiation: (Conversion) | Government Industrial Research Institute, Nagoya  |

Table 5. CFC Decomposition Technologies Developed in Our Country

(1) 化合物	$\Delta H_c$	(2) 混合物での99%分解温度, °C					(3) 純物質での99%分解温度	
		$\phi=0.05$	$\phi=1.0$	pyrolysis	$\phi=1.0$	$\phi<1.0$	$\phi=1.0$	$\phi<1.0$
CFC-113	0.11	770	780	780	780	780	780	780
carbon tetrachloride	0.24	670	680	680	750	750	750	750
trichloroethylene	1.74	730	780	920	800	780	800	780
chlorobenzene	6.60	730	800	>1000	900	700	900	700
toluene	10.14	670	750	820	820	680	820	680

Table 6. Thermal Decomposition Reaction of Hazardous Waste Mixture

Key:—1. Chemical Compound—2. 99% Decomposition Temperatures °C for Mixed Substances—3. 99% Decomposition Temperature for Pure Substances

In addition to the thermal decomposition method cited above, which uses external heat, combustion decomposition (or incineration method) throwing CFC into combustion flame also is being examined<sup>8)</sup>. Its equipment is shown in Figure 5. Since this is a practical decomposition method which utilizes general purpose incinerators, any research undertaken in this field in

the future merits our serious attention. Moreover, it is anticipated that CFC will find its way into city garbage in the future. From the standpoint of verifying the form of substance in which CFC will be emitted when it is burned at an incinerator, verification of the microvolume by-product from CFC (and mixtures) will be necessary.

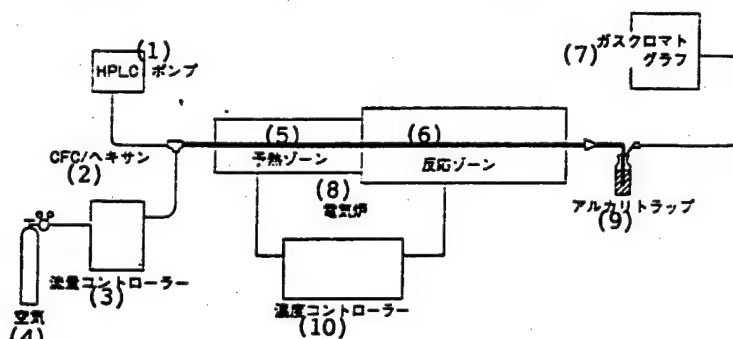


Figure 4. Flowchart of Thermal Decomposition Equipment

Key:—1. Pump—2. CFC/hexan—3. Flow controller—4. Air—5. Preheating zone—6. Reaction zone—7. Gas chromatography—8. Electric furnace—9. Alkali trap—10. Temperature controller

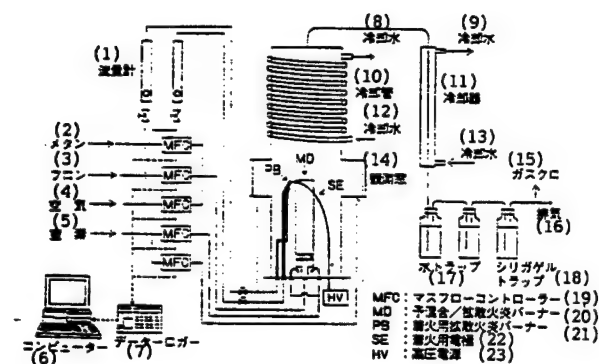


Figure 5. Schematic Diagram of CFC Combustion Destruction Equipment

Key:—1. Flowmeter—2. Methane—3. CFC—4. Air—5. Nitrogen—6. Computer—7. Data logger—8, 9. Cooling water—10. Cooling pipe—11. Cooler—12, 13. Cooling water—14. Observation window—15. Gas chromatography—16. Gas exhaust—17. Water trap—18. Silica gel trap—19. Mass flow controller—20. Premixed/diffusion flame burner—21. Ignition diffusion flame burner—22. Ignition electrode—23. High voltage electric source

#### 4.2. Plasma Decomposition Method

With respect to the plasma decomposition method, we have an example of continuous decomposition reactions carried out under the atmospheric pressure, using inductive coupling plasma reaction equipment<sup>1)</sup>. As shown in Figure 6, under atmospheric pressure, by letting argon flow inside a pipelike part housing a plasma torch while applying induction heat around it at a high frequency, the state of plasma can be obtained in the torch. Temperature of the plasma state has distribution with its central part reaching a maximum of nearly 10,000°C. When CFC gas is introduced into this flow, rapid decomposition of CFC occurs.

In a single reaction of vaporless CFC-11, it should be noted that  $\text{CCl}_4$ ,  $\text{CCl}_2\text{F}_2$ ,  $\text{CClF}_3$ , and  $\text{CF}_4$  are formed by disproportionation reaction;  $\text{C}_2\text{Cl}_4$ ,  $\text{C}_2\text{Cl}_3\text{F}$ , and  $\text{C}_2\text{Cl}_2\text{F}_2$ , by dimerization reaction; and  $\text{C}_6\text{Cl}_6$ ,  $\text{C}_6\text{F}_6$ , and  $\text{C}_6\text{Cl}_4\text{F}_2$ , by cyclic reaction. Additionally, a large quantity of soot is formed. The inversion rate of CFC was improved by introduction of steam, and an almost total curbing of side reactions from the disproportionation, dimerization, and cyclic reactions, as well as formation of soot, occurred, limiting byproducts to  $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{HCl}$ , and  $\text{HF}$ . If the steam-CFC supply ratio is set below the theoretical mixture ratio of 0.4, formations of  $\text{CO}$  will be greater than that of  $\text{CO}_2$ ; however, if the ratio were set at 2.0, then almost all formation will be that of  $\text{CO}_2$ . Consequently, reaction between steam and CFC can be represented by the following overall reaction:

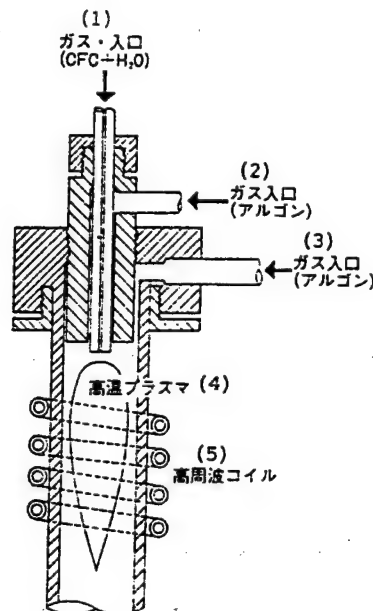


Figure 6. Schematic Diagram of Inductive Coupling Plasma Reaction Equipment

Key:—1. Gas/inlet—2. Gas inlet (argon)—3. Gas inlet (argon)—4. High-temperature plasma—5. High-frequency coils

The composition ratio is dependent upon high frequency electric power rate for plasma generation and flow velocity, and upon density of the reaction gas. In addition to steam, CFC reacts with oxygen and hydrogen. This is a type of thermal decomposition method particularly suited for processing a large volume of CFCs because of the method's ability to use ultra high temperatures and high velocity in decomposition process.

Moreover, use of corona-discharge plasma-generating equipment in the decomposition of CFC currently is being examined<sup>6)</sup>.

#### 4.3. Catalytic Decomposition Method

With the catalytic decomposition method, the decomposition of CFC is accomplished by having the CFC and steam made to flow successively over a solid catalyst under atmospheric pressure<sup>7)</sup>. High performance solid catalysts thus far reported include the zeolite types, alumina,  $\text{Tl}_2\text{O}_3$ -ZrO<sub>2</sub> system-mixed oxides, and iron-oxide-carrier activated carbon.

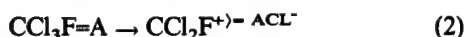
Catalytic performances are provided in Table 7 with examples. For instance, when gas, which contains CFC-11(1000 ppm) and steam (4000 ppm) and which is mixed with air, is flowing at the velocity of 500 ml/min and comes in contact with 1 g. of a H-type modenite catalyst, then 98% of CFC will be decomposed, forming  $\text{HCl}$ ,  $\text{HF}$ , and  $\text{CO}_2$ . It is indicated that since the HY zeolite with acid is more active than a NaY-type zeolite without acid,

Catalyst	Conversion of $C_2Cl_3F_3$ / %	Selectivity to $CO_2$ and $CO$ / %
HY-zeolite	85	99
NaY-zeolite	15	97
H-mordenite	98	99
H-ZSM-5	88	99
$\gamma$ - $Al_2O_3$	85	85
$SiO_2$ - $TiO_2$	40	100
$TiO_2$ - $ZrO_2$	100	100
$Fe_2O_3$	16	100
$SiO_2$	8	100
$ZrO_2$	1	99
$TiO_2$	0	---

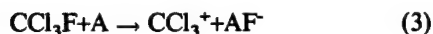
Reaction conditions:  $C_2Cl_3F_3$  1000 ppm,  $H_2O$  4000 ppm, balance air;  
WHSV =  $30 \text{ L(h g-cat)}^{-1}$ ; after 2 h reaction.

Table 7. Catalytic Decomposition of CFC-113( $C_2Cl_3F_3$ ) at 500°C

the acid site of catalytic surface participates in the reaction. Moreover, the reactivity caused by the difference in halogen composition places the compounds in the following order:  $CCl_4 > CCl_3F > CCl_2F_2 > CF_4$ . While the  $CCl_4$  completes its reaction at a temperature below 200°C,  $CF_4$  for the most part will not be decomposed, even at temperatures above 600°C. Since this reaction order matches with the bonding and dissociation energy order involving C-Cl and C-F, it is assumed that decomposition reactions will take place according to the following formulas:



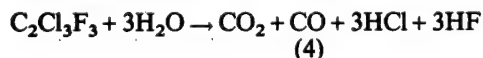
or



(A is an acid point on the catalytic surface)

It is conjectured that C-Cl, which has a smaller bond-dissociation energy, is preferred to the C-F in the abstraction of halogen atoms by the acid point. In the course of decomposition of the subsequent intermediate bodies, viz.,  $CCl_2F$  and  $CCl_3$ , steam probably will participate in the decomposition process, forming  $CO_2$ .

Reactions involving the ethane-system CFCs, such as CFC-113, will result in the formation of  $CO$ ,  $HCl$ ,  $HF$ , and  $CO_3$ . The quantities of  $CO$  and  $CO_2$  will be approximately the same. Although detailed accounts of reaction mechanisms must await future research, overall reaction formula may be written as follows:



Toxic  $CO$  thus produced can be handled by converting it into  $CO_2$  through oxidation by means of air present in the reaction gas. In order to accomplish this, it will be necessary to add a catalytic substance with oxidation capacity, such as Pt, to the CFC decomposition catalyst, so that the  $CO$  will be oxidized while CFC decomposition is taking place. In the catalytic reaction, the problem of durability of catalysts which can withstand successive reactions must be dealt with. Especially  $HCl$  and  $HF$  formations threatens catalytically active metallic oxides by converting them into non-active metallic halogen compounds. However, it has been verified that the  $TiO_2$ - $ZrO_2$  system catalysts normally remain active for more than 200 hours.

#### 4.4 Reagent Decomposition Method

The reagent decomposition method<sup>8)</sup> is designed to decompose CFC reductively by reacting sodium naphthalenide ( $Na^+naph^-$ ) dissolved in an organic solvent with either gaseous or liquid CFC, and by forming  $NaCl$  and  $NaF$  through reactions of  $Na^+$  ions in a reagent and that of CFC's Cl and F. As shown in Table 8, we used the THF as a solvent, adding 6 mol (theoretically equivalent quantity), and subjected CFC-113 to a decomposition process at 0°C for 400 minutes. The results were that, although we obtained the dechlorination ratio of 98%, the defluorination ratio was low (67%), indicating that CFC's F is more difficult to react than Cl is. We have been able to improve defluorination decomposition speed easily by adding an excess naphthalenide reagent, increasing the reaction temperature to one of above 40°C, and by addition of additives. For instance, by adding 1.5 times more tetracetylene glycoldimethyl ether (ME-4) or hexamethylenetetramine (HMTA) and producing a reaction at 150°C for 50 minutes, we were able to decompose the CFC-113 almost completely.

Table 8. Reductive Decomposition Reaction of CFC-113 by Sodium Naphthalenide

Solvent	Reductant Additive Ratio	Reductant Density	Additive	Reaction Tem- perature	Reaction Time	Dehalogenation Ratio (%)	
	e <sup>-</sup> /CFC-113	(M)	(vol%)	(°C)	(min)	Cl <sup>-</sup>	F <sup>-</sup>
THF	6	0.4	-	0	10	98	46
THF	6	0.4	-	09	400	98	67
THF	12	0.4	-	0	400	100	93
THF	12	0.4	-	40	100	99	88
THF	12	0.4	-	40	400	99	99
THF	9	1.2	ME-4(10)	100	50	100	89
ME-2	9	1.2	-	100	50	100	83
ME-2	12	1.2	-	100	50	100	93
THF	9	1.2	ME-4(10)	150	50	99	100
THF	9	1.2	HMTA(10)	150	50	99	97
THF	9	1.23	-	150	50	100	86

Moreover, research in the decomposition process of CFC-113 or of halogen in a pyridin-added aqueous solution at near room temperature, using a superoxide ( $O_2^-$ ) generated from  $NaIO_4/H_2O_2$ , is in progress<sup>9)</sup>.

#### 4.5 Supercritical Water Decomposition Method

Lastly, the supercritical water decomposition method is a system designed to use water in supercritical state, exceeding the critical point of water (374°C, 218 atm) and entering the phase in which it is neither liquid nor gas, thus providing a condition which facilitates the progress of reactions involving decomposition of added water. It has been reported that both CFC-11 and CFC-113 can be decomposed almost completely at 400°C and above 320 atm<sup>10)</sup>.

#### 5. Synthetic Destruction (Inversion to Useful Substance)

"Decomposition" aimed at material synthesis can be summarized as per Figure 7. Of these, currently under investigation is a method whereby CFC-113 either is dechlorinated or undergoes hydrogenation-dehydrochlorination process in order to synthesize monomers of chlorotrifluoroethylene and to produce fluorine polymers (polychlorotrifluoroethylene). Also being investigated is another synthetic route, viz., synthesizing one of the replacement CFCs, HFCF-134a from chlorotrifluoroethylene. For such a process, the thermal decomposition method, as well as catalysis<sup>11)</sup> and electrochemical technology<sup>11)</sup> are being studied. Moreover, although not a specified CFC, CFC-22 can be converted into tetrafluoroethylene monomer through the dimerization and dechlorination processes<sup>13)</sup>. Also considered is a synthesis of trifluoroacetic acid into an organic reagent. This means the establishment of industrial processes which will reuse the so-called wastes, and, as such, probably will require an extensive technical evaluation in which economic factors play an important role.

#### Bibliography

- 1) T. Wakabayashi, et al., Pro. 9th Int. Symp. Plasma Chem. Sept (1989).
- 2) Destruction Technology of CFCs (Interim Report)"; MITI, April 1989; "Destruction Technology of CFCs", Committee for Protection of the Stratospheric Ozone Layer, January 1990.
- 3) J. I. Graham, et al., Environs. Sci. Technol. 20, 703 (1986).
- 4) Masao Takeuchi, et al. Pollution (Kogai), 25, 98 (1990).
- 5) K. Tokuhashi, et al., Combust. Sci. Technol., 72, 117 (1991).
- 6) J. Skalny, et al., Proc. 9th Int. Symp. Plasma Chem., Sept. (1989) Pugnochiuso (Italy) p. 810; T. Yamamoto, et al., IEEE, 2176 (1989).
- 7) Hiromasa Tajima, et al., 30th Atmospheric Contamination Association Meeting, Collected Lectures (summary) (1989) Lecture No. 7321; Fukuoka Internat'l Symp.'90 (1990); S. Okazaki and A. Kurosaki, Chem. Lett. 1989, 1901.
- 8) A. Oku, K. Kimura, and M. Sato, Chem. Lett. 1988, 1789; Ind. Eng. Chem. Res. 28, 1055 (1989).
- 9) Kazuyoshi Matsunaga, et al. : Symposium on Environmental Pollutants and Their Toxicology. Nov. 1989.
- 10) Takeshi Sugata, et al. : Chemical Industry Association, 22nd Autumn Meeting, p. 553 (1989).
- 11) Satoshi Tomioka, et al., 1989 Catalysis Research Meeting. Lecture : Pre-print Manuscript Collection (1989) 3C31.

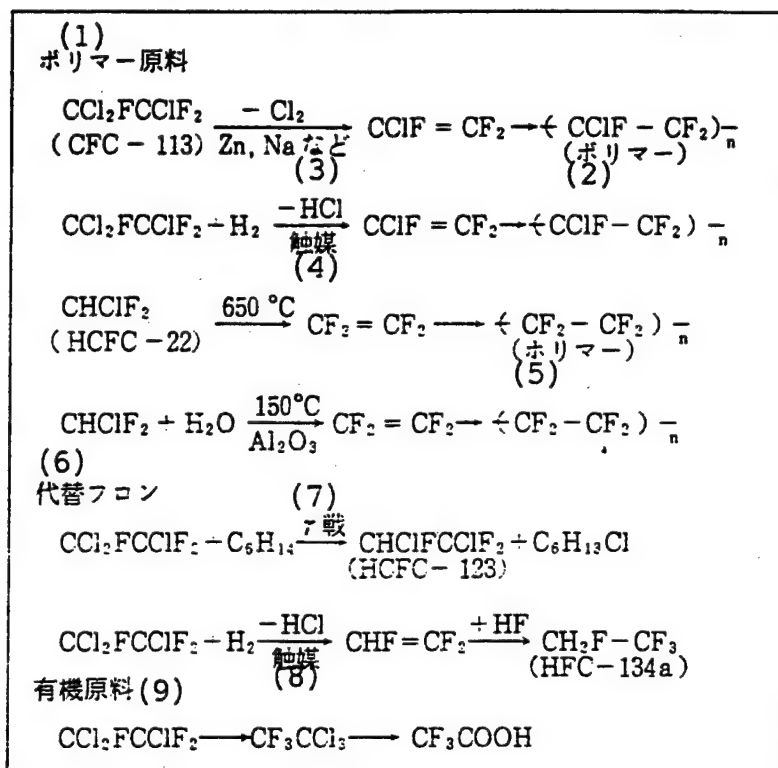


Figure 7. Examples of CFC Synthetic Destruction

Key:—1. Polymer material—2. Polymer—3. Etc.—4. Catalyst—5. Polymer—6. Freon Substitute—7.  $\gamma$  Ray—8. Catalyst—9. Organic material

12) K. Tezuka and T. Yajima : Electrochemistry Society's Annual Autumn Meeting (1989) 2B20.

13) N. Ishikawa and Yoshio Kobayashi : "Fluorine Compounds: Their Chemistry and Applications", Kodansha Scientific (1979).

### Artificial Photosynthesis : Development

#### Introduction

The problem of global warming, caused by a rising level of concentration of  $\text{CO}_2$  in the atmosphere, is linked to the twin problems of dwindling fossil fuel energy sources and carbon resources, thus casting deep shadows over the future of welfare of mankind. Prior to the Industrial Revolution,  $\text{CO}_2$  released into the atmosphere by the respiratory systems of all living beings was being reduced to organic substances by plants' photosynthesis and thus removed from the atmosphere, thereby maintaining an acceptable balance. Industrial activities carried out by mankind since the 19th century, however, had unilaterally consumed carbon resource stored over the centuries by photosynthesis while continuing to release  $\text{CO}_2$  into the atmosphere. This essentially is the cause of the problems referred to in the above. If we could but construct an artificial system possessing a

function similar to the photosynthesis of plants, this possibly may be the ideal way in which to solve this problem of imbalance.

The green plants create hydrogen, sugar, and starch from  $\text{CO}_2$  and water by using the sun's energy. Figure 2 shows a type-diagram of the photosynthesis. The following functions are performed by photosynthesis:

- Absorption of solar light by antenna pigments;
- Delivery of absorbed solar energy to a reaction center (P-680 and P-700) with high efficiency (quantum yields-1) and high speed ( $< 0.25$  picosecond);
- Efficient charge separation at the reaction center;
- Oxidation of water in system 2, transfer of electrons and protons to system 1, and synthesis of ATP (phosphorylation of ADP);
- NADPH synthesis in system 1 (reduction of NADP); and
- Fixing  $\text{CO}_2$  through reduction in a  $\text{CO}_2$  reduction circuit using NADPH and ATP.



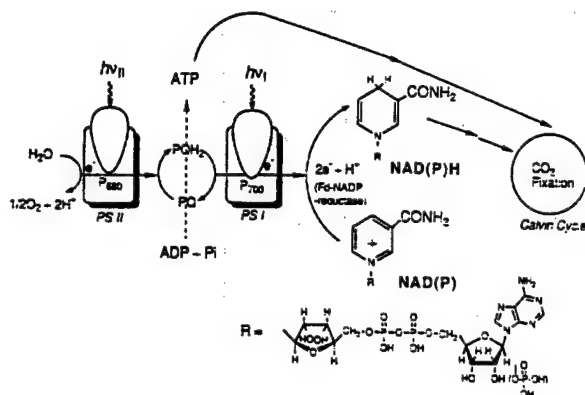


Figure 2. Type Diagram of Photosynthesis

The photosynthesis, therefore, is an extremely efficient chemical reaction, containing a wide variety of elementary processes.

Unfortunately, however, there are many areas of photosynthesis dealing with the structure of organs which have yet to be explained, and vigorous research grappling with this problem is being undertaken at various places. Benefiting from the findings of such activities, development of a wide variety of artificial photosyntheses are currently being pursued at research level. The two major currents which categorize these developmental research are as follows:

- (1) Aims for the development of artificial photocatalytic systems designed to reduce and fix  $\text{CO}_2$ ; and
- (2) The ability to explain how each photosynthetic function works and the causes of its expressions; to construct its modeling systems; and to work toward the development of artificial synthesis systems by organically combining this knowledge and these techniques.

In the course of this lecture, I wish to cover the present state of the artificial synthesis centering around research currently being conducted by our institute. My paper, however, will focus primarily on the results of our work. As to those of you who are particularly interested in item (1), I refer you to pages 232-248 of a report published in Ohm Co.'s "Technologies For Dealing With Global Warming," in which our research findings were summarized.

### 1. $\text{CO}_2$ 's Methane Forming Reaction By Means Of Photoreduction Using Water Containing Metal-Carrier $\text{TiO}_2$

Honda and Fujishima<sup>1)</sup> reported that, when a semiconductor powder or a single crystal, represented by titanium dioxide ( $\text{TiO}_2$ ), is irradiated, an electrolytic separation, accompanied by decomposition of water on semiconductor surfaces, occurs, forming hydrogen and oxygen. Since then, research from the standpoint of

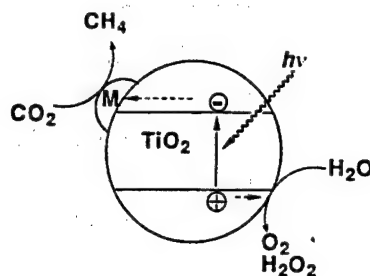


Figure 3. Photoreduction of  $\text{CO}_2$  By Water Which Uses  $\text{TiO}_2$

chemical conversion of solar energy has been conducted extensively. This phenomenon can be utilized in photoreduction of  $\text{CO}_2$  (Figure 3). It has been reported that main products of the photoreduction of  $\text{CO}_2$  using  $\text{TiO}_2$  are formic acid, formaldehyde, and methanol. Although this photocatalysis does have a certain advantage, viz., water can be used as a reductant, its reaction efficiency is extremely low.

We are investigating the  $\text{CO}_2$ 's photoreduction reaction using the  $\text{TiO}_2$  which carries various types of metals. When an irradiation device with closed-circulation, shown in Figure 4, is used, we have found that methane will be a primary product, its volume exhibiting a sharp upward curve because of the metal carrier  $\text{TiO}_2$  in use.

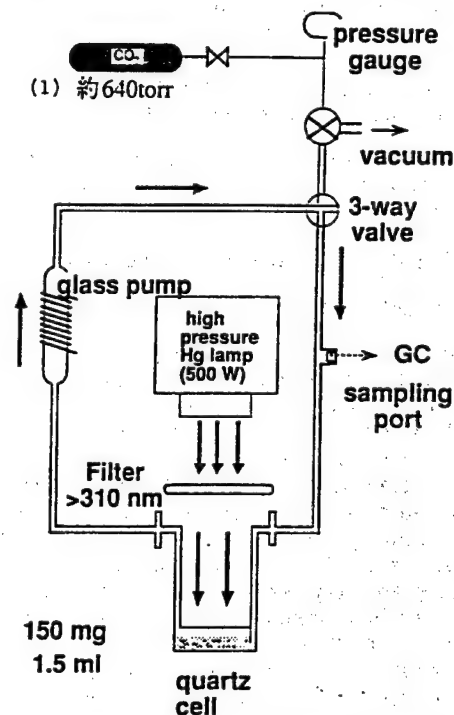


Figure 4.  $\text{CO}_2$  Photoreduction Equipment Based On Semiconductor- $\text{TiO}_2$  Water Suspension System

We used a Degussa product P-25 for the  $\text{TiO}_2$ . Since its surface was pretty much contaminated by organic substances (primarily acetic acid), it was sintered at  $300^\circ\text{C}$  under clean air for eight hours, after which it was suspended in water. After removing organic substances by means of irradiation in the air, the  $\text{TiO}_2$  was used in photoreaction. By irradiating a suspension aqueous solution of  $\text{TiO}_2$  containing metallic chlorides equivalent to its 2 wt % (metallic conversion) under the helium atmosphere for a period of one hour, a metal carrier  $\text{TiO}_2$  was produced. After the metal carrier  $\text{TiO}_2$  ( $\text{M-TiO}_2$ :  $\text{M}=\text{metal}$ ) had been thoroughly cleaned in the water and dried at  $200^\circ\text{C}$ , it was used in reaction. The fact that no organic residue was found on the  $\text{M-TiO}_2$  was verified by GC and IC.

$\text{CO}_2$  photoreduction reaction was conducted by pouring 1.5 cc water containing 150 mg. of suspended  $\text{TiO}_2$ , or  $\text{M-TiO}_2$ , into a quartz cell. After having been completely

frozen and degassed,  $\text{CO}_2$  was introduced at approximately 650 torr. Then, irradiation of less than 310 nm light was performed while the cell was being cooled by ice water.

Table 1 shows the products formed after five hours' irradiation. From these results, the following has become clear:

(1) Methane is a primary product; (2) When Pd, Rh, and Pt are carried, the volume of methane drastically increased. Especially in the case of  $\text{Pd-TiO}_2$ , reaction activity increased almost thirty times as much as with non-metal carrying  $\text{TiO}_2$ ; (3) On the other hand, no effects were registered by Ru; and (4) Neither formic acid nor methanol was detected, which appeared to indicate that re-oxidation of most products in a liquid phase took place. It was interesting to note that when  $\text{Rh-TiO}_2$  and  $\text{RuTiO}_2$  were used, a fair amount of acetic acid (an oxidation compound) was extracted.

**Table 1. Photoreduction of  $\text{CO}_2$  Which Uses  $\text{M-TiO}_2$  and Its Product After 5-hour Irradiation**

M-TiO <sub>2</sub>	Products / $10^{-8}$ mol					
	$\text{CH}_4$	$\text{C}_2\text{H}_2$	$\text{HCO}_2$	$\text{CH}_3\text{CO}_2\text{H}$	$\text{CH}_3\text{OH}$	$\text{C}_2\text{H}_2\text{OH}$
$\text{TiO}_2$	0.7	0.1	< 0.5	< 1	< 1	< 1
$\text{Pd-TiO}_2$	24.7	1.4	< 0.5	< 1	< 1	< 1
$\text{Rh-TiO}_2$	10.0	0.9	< 0.5	5.0	< 1	< 1
$\text{Pt-TiO}_2$	5.0	trace	< 0.5	< 1	< 1	< 1
$\text{Ru-TiO}_2$	0.6	trace	< 0.5	2.0	< 1	< 1

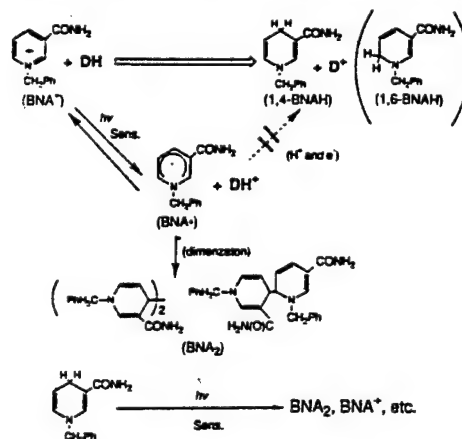
Our experiment looked into the deterioration caused by age in the formation of methane when the  $\text{Pd-TiO}_2$  (which show the best efficiency rate in reaction) was used in photocatalysis. Until after seven hours' irradiation, methane exhibited linear efficiency. Beyond that point, however, efficiency gradually declined. After 24 hours' irradiation,  $\text{Pd-TiO}_2$  became frozen and degassed. When  $\text{CO}_2$  was reintroduced at this point and irradiation was resumed, the amount of methane showed a linear increase; its efficiency, however, was reduced to one-fifth of that attained in the initial reaction period. From the results of XPS, it became clear to us that this was caused by oxidation of a portion of Pd's surface, which produced  $\text{PdO}$ .

## 2. NAD (P) Model Compound's Selective Two-electron Reduction Using $[\text{Ru}(\text{bpy})_2(\text{Py})_2]^{2+}$ As a Photocatalyst

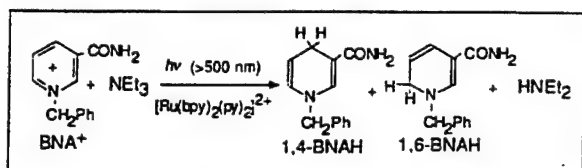
Plants use solar light as a driving power of photosynthesis and produce  $\text{NAD(P)H}$  through two-electron reduction of coenzyme NAD (P) (See Figure 2). This reaction is an important elementary process which links the separation of the charge occurring centering around photosynthesis to the synthesis of NAD (P) which is a  $\text{CO}_2$  reductant. An experiment on the reduction of NAD (P) and its model compound using an artificial photosynthesis system interested researchers, but no research paper, reporting on achievement of high yield and product distribution approximating those of photosynthesis, has yet to appear. I should like to call your

attention to the following three reasons why this reaction cannot be duplicated readily in an artificial photosynthesis (See Figure 6. In an example given,  $\text{BNA}^+$ , the most representative of the NAD (P) model compound, was used):

(1) Our goal is to convert, selectively,  $\text{BNA}^+$  into corresponding 1,4-BNAH. In order to achieve this, two-electron reduction must be conducted. Photoelectron migration reaction has a fundamental problem in that,



**Figure 6. Reasons Why Two-Electron Reduction Present Difficulty For NAD (P) Model Compound ( $\text{BNA}^+$ )**



Formula 1

because one photon is absorbed, there is only one electron remaining to migrate. For this reason, a catalytic system in which photoelectron migration occurs, BNA<sup>+</sup> is reduced by one electron and converted to BNA. Since its dimerization reaction occurs at high speed, dimers (BNA<sub>2</sub>) are formed selectively, making it impossible to obtain 1,4-BNAH.

(2) Even if a regular hydride reductant (for instance, NaBH<sub>4</sub>) is used and reduction performed, with priority given to the isomer, 1,6-BNAH still is formed first.

(3) Since 1,4-BNAH is a good reductant, it is oxidized easily.

We have discovered, however, that [Ru(bpy)<sub>2</sub>]<sup>2+</sup>(bpy=2,2'-bipyridin;py=pyridin) and its analogous complex function as photocatalysts which selectively perform two-electron reduction of BNA<sup>+</sup>.

Reduction was performed under argon atmospheric pressure by irradiating, with an > 500nm light, a DMF solution containing [Ru(bpy)<sub>2</sub>(py)<sub>2</sub>]<sup>2+</sup>(0.4mM), BNA<sup>+</sup>(1mM), and triethylamine(0.5M) in a thermostatic tank set at 22°C. Products of the BNA<sup>+</sup> and the Ru complex were identified and quantified by HPLC and other products by GC.

Forty-six hours of irradiation resulted in the formation of 1,4-BNAH at the rate of 70%, together with an extremely small quantity of 1,6-BNAH (a 3% yield). Moreover, approximately the same amount of diethylamine (triethylamine's two-electron oxidation product) as BNHA also was detected. At this time, it was noted that either the Ru complex was completely absent or that hardly any formation of BNAH was found. Moreover, the turnover number exceeded 1, indicating that the Ru complex had functioned as a photocatalyst (Formula 1).

In this photocatalytic reaction, any presence of BNA<sup>+</sup>'s one-electron reduction dimer (BNA<sub>2</sub>) was not detected, with two-electron reduction alone occurring selectively. Figure 7 shows the amounts of 1,4- and 1,6-BNAH formed against irradiation time and formation selectivity of 1,4-BNAH. You will be able to see from this that since the beginning of the reaction, 1,4-BNAH had been formed at a high degree of selectivity (approximately 95%). Thermal isomerization of 1,6-BNAH to 1,4-BNAH is slow; and under present reaction conditions,

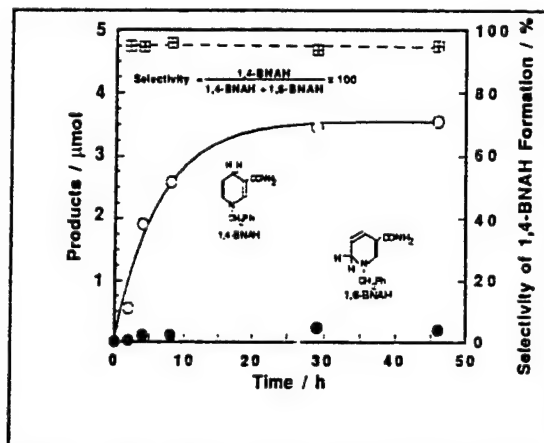


Figure 7. Reduction Reaction of BNA<sup>+</sup> by E<sub>13</sub>N Using [Ru(bpy)<sub>2</sub>(py)<sub>2</sub>]<sup>2+</sup> as Photocatalyst

selectivity has had hardly any effect. Moreover, with the Ru complex, triethylamine, and BNA<sup>+</sup> coexisting, no amount of irradiation was able to accelerate the speed of isomerization, and we realized that the 1,4-BNAH's highly selective formation actually resides in the essential characteristics of this photocatalytic reaction itself. Moreover, we observed that, after formation of BNAH had reached its peak, continuation of irradiation produced no decomposition of BNAH.

It is clear that this reaction does not proceed with a simple migration of photoelectrons. Interestingly, [Ru(bpy)<sub>2</sub>]<sup>2+</sup> rapidly declined immediately after irradiation, disappearing completely in 10 minutes. When we tracked this deterioration process, attributable to age, using ultraviolet visible absorption spectrum, we saw that the [Ru(bpy)<sub>2</sub>(py)<sub>2</sub>]<sup>2+</sup> faded and a spectrum which possesses the absorption maximum of 480,342 nm, while maintaining the isosbestic point, appeared. This could be identified as [Ru(bpy)<sub>2</sub>(py)(L)]<sup>2+</sup>(L=NEt<sub>3</sub>, DMF). This complex remains relatively stable while reactions are in progress. Moreover, since addition of pyridin suppressed the formation of BNAH and [Ru(bpy)<sub>2</sub>(py)(L)]<sup>2+</sup>, we realized that this photoligand exchange started the reaction of the BNA<sup>+</sup> reduction. The mechanisms of this reaction are shown in Figure 8. Since the speed of the BNAH formation primarily is dependent on the density of the amine complex [Ru(bpy)<sub>2</sub>(py)(NEt<sub>3</sub>)<sup>2+</sup>, when [Ru(bpy)<sub>2</sub>(py)(NEt<sub>3</sub>)]<sup>2+</sup> was excited by light, it was reduced by coordinated triethylamine, forming [Ru-H] possessing a hydride donor function. It is our supposition that it had been the [Ru-H] which reduced the BNA. The fact that BNA<sup>+</sup>'s fourth position was reduced with high selectivity indicates that in the process of two-electron reduction, some kind of interaction took place between the Ru complex and the amide group.

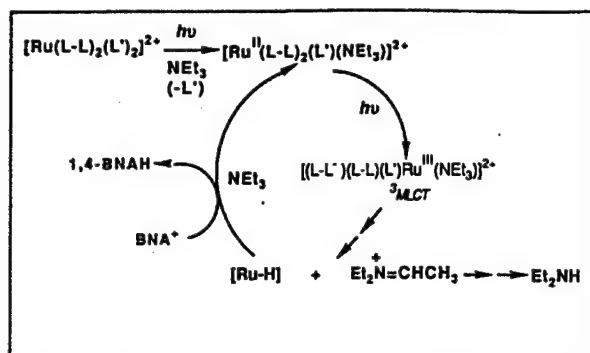


Figure 8. Reaction Mechanisms of BNA<sup>+</sup> Reduction

### Japan To Propose 'End to Export of Pollution' at Earth Summit

OW1003113492 Tokyo KYODO in English 1048 GMT  
10 Mar 92

[Text] Tokyo, March 10 (KYODO)—Japan will propose at June's environment summit in Brazil that advanced nations halt both their disorganized approach to development in poor nations and the "export of pollution," an advisory council to the Environment Agency reported Tuesday.

The advisory group will propose that nations share with each other information on environmental assessments and that developed nations guarantee that they will treat the environments of other nations as they would their own.

The roundtable on global environmental issues reported to Agency Director General Shozaburo Nakamura on proposals they will raise for adoption by the global environment summit in June.

The summit is to adopt an environmental "constitution" which is expected to embody a collection of action principles to be observed by individuals and nations in order to preserve the global environment heading into the next century.

The government is offering a preview of the proposals at a current meeting of the summit's preparatory committee in New York and the agency plans to circulate overseas an English-language translation of the proposals in the near future.

The proposals begin with the fundamental recognition that developing nations as well as advanced nations consider material affluence to be of supreme importance.

The proposals call for a complete change of viewpoint and point to the necessity of reforming methods of production, consumption, development and trade to harmonize with the environment.

Recognizing that coexistence of humankind with nature and its living creatures must be a general principle for both individuals and nations, the proposals request that preventive measures be taken for the assessment and scientific elucidation of the environment.

As an "action principle for the organization of a socio-economic system of environmental protection," the proposals say that the technology transferred from advanced nations to poorer nations should be appropriate to the actual conditions within the recipient nations.

They also warn against the one-sided transfer of advanced technology and machinery.

### Financial Aid Plans for Global Environment To Be Unveiled at Rio-92

OW1603134392 Tokyo JIJI in English 1320 GMT  
16 Mar 92

[Text] Tokyo, March 16 (JIJI PRESS)—The government plans to loosen its purse strings to give greater financial support for protection of the global environment.

Tokyo's plan to contribute more positively to international environmental protection will mean shouldering a larger share of the World Bank's Global Environment Fund (GEF) and giving more official development assistance (ODA) funding to countries that make efforts to protect the environment, a government source said Monday.

Japan will unveil its plan at the U.N. Conference on Environment and Development, dubbed the Earth Summit, to be held in Rio de Janeiro in June, the source said.

The GEF is a three-year pilot program set up last year by the World Bank to help combat problems such as global warming and to develop diverse methods of preserving endangered flora and fauna.

Japan contributed 230 million dollars to the 1.5-billion-dollar GEF pool funded by advanced industrialized nations. The fund is expected to be expanded to 2 billion to 3 billion dollars after the three-year pilot phase ends in 1993.

Japan is expected to announce its contribution to the second GEF fund at the Earth Summit.

Japan will also unveil plans to put greater priority on rewarding developing countries efforts to protect the environment when it allots ODA assistance.

The step addresses the question of achieving a balance between economic development and environmental protection, an issue that is expected to feature on the Earth Summit agenda.

Japan may apply easier interest rates or eligibility standards for yen loans and grants for recipient countries when aid projects concern protection of the environment

such as environmental assessment, training of anti-pollution specialists or or development of pollution-combatting technology, the source said.

But Tokyo may not be able to spell out plans for boosting ODA spending at the Rio de Janeiro meeting, as the government's next medium-term program for ODA expansion is not likely to be finalized by June, the source said.

The current five-year plan to increase Japan's ODA for 1988-1992 to over 50 billion dollars, or more than doubling the sum disbursed during the previous five years, is now believed certain to be achieved.

#### **Official Voices Opposition to ASEAN Malacca Straits Cleanup Tax**

*OW1703094392 Tokyo KYODO in English 0849 GMT 17 Mar 92*

[Text] Kuala Lumpur, March 17 (KYODO)—Any moves to impose a tax on ships using the busy Malacca Straits to cover pollution cleanup costs should be discussed by all countries and not just littoral states, a Japanese official said here Tuesday.

"Such a scheme should be discussed multilaterally and multinationally, not only among the ASEAN countries," said Noboru Hatakeyama, vice international trade and industry minister for international affairs.

The six-nation Association of Southeast Asian Nations (ASEAN), concerned about increasing pollution of the waterway, has proposed a tax or levy be imposed on ships to pay for a cleanup.

Japan's vital oil supplies from the Middle East pass through the 800 kilometer-long Straits between Malaysia and Indonesia. About 50,000 vessels a year ply the waterway—among the world's busiest—that links the Indian Ocean with the Far East.

Hatakeyama said it is necessary for negotiations on any tax to involve all countries to avoid setting a precedent for world sealanes.

"Otherwise, Japan might put a levy on ships going through the Japan Sea or nearby Japan," he said. There are many narrow straits "here and there," he added after meeting Malaysian Trade and Industry Minister Rafidah Aziz.

Shippers have opposed the levy, saying it will serve as a dangerous precedent for other shipping lanes. They also said that if such a levy is imposed, the added costs will be passed on to consumers.

The Paris-based International Chamber of Commerce (ICC) last month suggested that a world body such as the international maritime organization discuss the matter and set guidelines.

Malaysian Prime Minister Mahathir Mohamed suggested in January that shippers contribute toward maintenance of the waterway. This was soon followed by a call by Indonesian President Suharto for the shipping levy.

Apart from frequent oil spills caused by ship collisions, Malaysia and Indonesia are concerned about the irresponsible discharge of chemical wastes, toxic substances, and oil sludge, which pollute coastal fishing grounds and tourist spots.

#### **Poll Shows Many Concerned About Effects of Biotechnology**

*OW1803150792 Tokyo KYODO in English 1108 GMT 18 Mar 92*

[Text] Tokyo, March 18 (KYODO)—Three out of four Japanese are concerned about the possible adverse environmental effects of gene recombination and other biotechnology techniques, according to an Environment Agency poll released Wednesday.

The poll findings have encouraged the agency to consider instituting a system to check and ascertain the safety on the environment of creatures whose gene combinations are artificially altered and manipulated by scientists, agency officials said.

The agency's consideration of a new checking system comes as some scientists warn that creatures who have been subjected to gene recombination, once placed outside laboratories, might disrupt the balance of the eco system unless the authorities strictly check and ensure their safety.

The survey covered 1,500 citizens who had been entrusted by the agency with monitoring changes in environments. Some 91 percent or 1,363 responded to the poll, which was conducted last year.

Some 75 percent of the respondents expressed concern about the possibly adverse effects of biotechnology on the eco system and on peoples' health, according to the poll.

Some 66 percent acknowledged the positive sides of biotechnology, saying that biotechnology might contribute to the development of new medicines.

### **SOUTH KOREA**

#### **Businesses Spend More on Pollution Facilities in 1991**

*SK0903223292 Seoul YONHAP in English 0808 GMT 9 Mar 92*

[Text] Seoul, March 9 (YONHAP)—Businesses spent 595.6 billion won (780 million U.S. dollars) on pollution facilities last year, up 55 percent from 1990, a source at the Energy and Resources Ministry told YONHAP on Monday.



This information was discovered by questioning the 631 firms in Korea that specialize in pollution facilities, he said.

Speaking on condition of anonymity, he told YONHAP that the ministry had attributed the surprising increase to voluntary efforts to control pollution after phenol was dumped into the Nakdong River last year.

He said 307.2 billion won was spent on water preservation facilities, 257.6 billion won on air preservation, and 30.7 billion won on noise control.

The total accounts for 3.2 percent of that year's facilities investment of 18.48 trillion won, up 0.86 percentage point over 1990's 2.36 percent.

Hyundai Precision and Industry Co. supplied 31.6 billion won of pollution control facilities to 21 customers, followed by Goldstar Plant Co. with 30.9 billion won, Kolon Engineering Co. with 30.8 billion won, and Lotte Engineering and Machinery Manufacturing Co. with 28.3 billion won, the source said.

Seven of these industries advanced abroad, winning 67 million dollars in contracts in seven Southeast Asian nations, including Thailand, Indonesia and Taiwan.

"As air and water pollution standards are to be sharply tightened in January 1995 and January 1996, respectively, pollution facilities investment will rise to the 1 trillion-won range this year and 3.6 trillion-won level in 2000," he said.

#### **Bill Plans Benefits for Residents of Waste Disposal Site Areas**

*SK1503063292 Seoul THE KOREA TIMES in English 15 Mar 92 p 3*

[Text] Residents of areas where incineration and other waste disposal facilities are located will receive as much as 2 billion won as well as annual financial contributions from the government for welfare programs, in their areas.

According to the Environment Ministry yesterday, the details of a related draft bill have been finalized and will go into effect next year after it is approved by the National Assembly.

Under the provisions of the bill, residents in affected areas could receive a one-time fund of 100 million to 2 billion won, depending on the size of the community and waste disposal capacity.

They will also receive annual contributions of between 10 million to 200 million won for the maintenance of social rehabilitation and welfare facilities, ministry officials said.

Through the program, the government is seeking to recruit more areas for the location of waste disposal facilities while enhancing the standards of living there as well, they explained.

The amount of the annual financial assistance, however, will be within 10 percent of the profit made by operating the incineration and waste disposal business to be undertaken by private companies.

The provision of such funds also means that the responsibility for conducting environmental inspections related to waste disposal will be transferred to the operators and residents, the officials elaborated, this making them more aware of the environment.

With the bill finalized, the ministry will begin screening new candidate sites for waste disposal on the basis on a stringent guideline designed to protect the natural environment.

The new sites will have to be located far from places where sources of water can become contaminated, officials said, adding that scrupulous safety precautions will have to be taken in constructing the facilities.

#### **Government To Spend \$352 Million Per Year for Environment**

*SK1803081692 Seoul YONHAP in English 0713 GMT 18 Mar 92*

[Text] Seoul, March 18 (YONHAP)—South Korea will spend 270 billion won (352 million U.S. dollars) over the next 10 years in some key projects aimed at protecting the environment, an Environment Ministry source said Wednesday.

The spending, part of the "G7 project" aimed at making Korea an advanced nation, includes 195.5 billion won (254 million dollars) from state coffers for development of alternative materials to chlorofluorocarbon (CFC), water and air pollution prevention technologies, and waste disposal technologies, according to a tentative plan.

The government will form an ad hoc committee chaired by the vice environment minister to decide and coordinate details of the environmental projects.

As for the CFC-related project, the Korea Institute of Science and Technology and Ulsan Chemical Co. will be commissioned to carry out a joint research and development, it was said.

To induce active participation by private enterprises, the government is considering tax benefits, the source said.

#### **Company Plans Production of CFC Substitute**

*SK2403023492 Seoul THE KOREA TIMES in English 24 Mar 92 p 3*

[Text] Ulsan Chemical Co. said yesterday that, after nine years of research, it is almost ready to start production of a substitute for ozone-destructive chlorofluorocarbons (CFCs).

Ulsan Chemical told Vice Science Technology Minister So Chong-uk it would begin building a plant with a

capacity of 10,000 tons of halo-CFC (HCFC)-22 annually this year and complete it by the end of 1994.

HCFC-22 is one of 20 known CFC substitutes. Eighty-one nations have so far joined the Montreal Protocol on Substances that deplete the ozone layer, which bans any use of CFCs from the year 2000. Some members, such as the United States and the European Community, are talking about pushing up the date to 1996.

Protocol members can deny imports of CFC-using products from non-members.

South Korea applied to the Montreal Protocol in February and is expected to become a full member by the end of May.

The chemical firm began research on HCFC-22 nine years ago jointly with the Korea Institute of Science and Technology (KIST). The substance will replace CFCs in air conditioners and fire extinguishers.

HCFC-22 has a 0.05 ODP (Ozone Depletion Potential), compared to 1.0 for CFC. It is effective up to 15 years, but can destroy the ozone layer when used for long period of time and thus is suitable only as a temporary substitute, according to experts.

Company officials said they will test-produce substitutes such as HCFC-141B and HCFC-142B until end of June, and start plant construction in 1993.

#### **Industrial Companies Reprimanded for Environmental Violations**

SK2803013792 Seoul THE KOREA TIMES in English  
28 Mar 92 p 3

[Text] Subsidiaries of the nation's largest conglomerates, including Daewoo and Lucky-Goldstar business groups, have been reprimanded for violating environmental regulations.

A total of 251 industrial companies were found to be exceeding permissible limits and directed to suspend production or administer corrective actions or referred to law enforcement authorities, the Environment Ministry said yesterday.

Environmental inspections were conducted on a total of 3,553 companies during the first two months of the year and the firms are believed to have been lax in operating related equipment with the general elections just around the corner.

The ministry said the development is rather worrisome since large companies, which have the financial means to operate effective treatment facilities, have repeatedly been found to be discharging harmful substances into sources of water.

According to ministry officials, Daewoo Motors and Cheil Sugar were caught for leaking hazardous substances without treatment and told to operate related facilities properly.

Pacific Industries, an affiliated company of the cosmetic giant Pacific Chemicals, was discovered to have discharged harmful waste for the fifth time since last April and ordered to suspend all production.

The company was previously directed to improve its waste treatment facilities over the past year but failed to conform to environmental regulations, the officials said.

## **LAOS**

### **Conservation of Scrub Forest Urged**

92WN0271A Vientiane PASASON in Lao 3 Jan 92 p 2

[Unattributed report: "Reforestation"]

[Excerpt] [passage omitted] From an initial survey it was learned that we have almost 7 million hectares of scrub forest throughout the country (this includes both young scrub and old scrub forest). If this forest land were cared for, that is, if it was not destroyed further, it could again become thick forest.

There is scrub forest throughout the country. It is the result of such forest destruction that the size of the trees decreases. If such a forest is left alone and not disturbed, it will grow back because the land is still fertile. Scrub forest or open forest is generally found in the North, where there are 4,254,000 hectares. In the central region there are 1,630,600 hectares, and in the South there are 1,612,600 hectares.

Although such forest does not include many large trees, it is still a target for destruction by our people, primarily for slash and burn agriculture. It is certain that if such forest is often disturbed, it will not be able to recover or will not be able to become dense again. On the other hand if it is cared for, it will become a dense forest again in the future. Many forestry specialists have said that this is a good method because it does not use up capital, labor, and time. If we want to use this approach, there will have to be cooperation from many sides.

Reviving and conserving scrub forests is a good approach which will be very advantageous for us. If we avoid cutting the scrub forest we have now, it will grow big again, and in the future we will have almost 7 million hectares more forest. If this were added to the more than 10 million hectares of forest that we have now (if we use these forests in such a way as to conserve them), our country would have 17 million hectares of forest which would cover 70 percent of the country—this is what our country needs.

## **PHILIPPINES**

### **Subic Bay Incinerator Plan Would Import Toxic Waste for Disposal**

HK1603051392 Manila PHILIPPINE DAILY  
INQUIRER in English 16 Mar 92 p 12

[By Cynthia D. Balana]

[Text] Malacanang is seriously considering a plan to import wastes and burn these in a proposed \$300-million incinerator in Subic to test if the government can effectively handle toxic wastes.

Under the plan proposed by Alejandro Melchor, presidential adviser on the base conversion, an Austrian company will export toxic waste to the Philippines where it will be burned at an incinerator plant to be built close to the Subic base.

Presidential spokesman Horacio Paredes said yesterday that Environment and Natural Resources Secretary Fulgencio Factoran promised to look into Melchor's proposal and the hazards it would pose on the environment.

The incinerator project was part of a blueprint for converting Subic base into a commercial free port and industrial center, Melchor said.

The government has voiced concern about possible toxic waste and contamination left behind when American forces pull out of Subic by the end of the year.

But Melchor said the pollution problem at the base was not serious and future wastes would be burnt at the incinerator which would also generate power for the proposed industrial zone.

"We have a big incinerator project to handle toxic waste and, surprisingly, we don't have all that much garbage, so we're going to be importing it—industrial waste, medical waste, what have you," Melchor said.

Paredes, however, expressed doubts on the Melchor plan by citing a Cabinet resolution as early 1986 not in import any kind of waste into the Philippines.

He said a similar project was proposed by a Japanese group which offered to get all the lahar from Central Luzon which they could make into building blocks in Japan.

In exchange, however, the group wanted to export their plastic waste to the country which Factoran immediately rejected because of this resolution.

"There is a very, very great danger when you go into this kind of situation because of the lack of places where you can dump garbage in the world," Paredes said. "There is a very, very strong basis for thinking that we will be getting the worst kind of waste."

Paredes said that Third World countries like the Philippines which do not have the facilities for burning waste should not receive wastes which, he said should be the problem of the First World or industrialized nations.

He said the waste problem in the country was already bad but not as bad as those of the First World nations.

## THAILAND

### Worsening Chiang Mai Pollution Problems Cited

92WN0263C Bangkok DAO SIAM in Thai 3 Jan 92  
pp 11, 15

[Excerpt] [Passage omitted] Dr. Suphon Khuttatthep, a professor with the Department of Environmental Engineering, Faculty of Engineering, Chiang Mai University, who has played a major role in studying environmental problems in the north, talked about the environmental problems in the northern provinces. He said that, based on studies conducted during 1991, there are three main environmental problems in the northern provinces: 1. water quality, 2. waste disposal, and 3. polluted air.

With respect to polluted water, today, there are many new communities, and many industrial plants are being built. Because of this, more and more water is being used by these communities and plants. After using the water, the communities and plants dispose of the waste water by draining it into the rivers. Because of this, important rivers in the northern provinces are becoming polluted. This includes the Ping and Wang Rivers, which pass through Lampang Province. The Ping River is very polluted, and in the dry season, the situation becomes even worse. Smaller water sources, including the Mae Kha canal and the Chiang Mai City moat, are even more polluted. It can be said that they are completely polluted.

The situation with respect to the Yom, Ing, and Kok Rivers in Chiang Rai Province is quite good. This is because there are not too many communities or industrial factories there.

"Besides the rivers and canals, there are also underground water sources about which we are very concerned. Based on the existing data, the underground water sources in Chiang Mai City are quite polluted. In particular, water from the shallow wells located at a depth of five to 10 meters can no longer be used for consumption," said Dr. Suphon.

This scholar also talked about the garbage problem in Chiang Mai. He said that garbage disposal is still a problem. There is no permanent disposal site. A waste disposal site must be found very soon.

Dr. Suphon said that air pollution is very bad. People will start burning more grass, upland fields, and trees, and this will be difficult to control. This will put even more smoke and dust into the air. The northern region is a large valley without strong winds. Thus, the smoke and dust tend to stay in place above the ground there. Studies conducted by Chiang Mai University have shown that Chiang Mai City has a rather high amount of dust, particularly near ground level. The amount of dust present in the air is quite a bit above the level set by the Environmental Board. In short, air quality is at the danger level.

### Industry Minister on Antipollution Measures

92WN0263F Bangkok SIAM RAT THURAKIT in Thai  
4 Jan 92 pp 7, 14

[Excerpt] [passage omitted] Mr. Sippanon Kethat, the minister of industry, talked about the ministry's policy in 1992. He said that for the most part, the ministry will continue to adhere to the existing policy, particularly with respect to helping reduce pollution stemming from the activities of industrial plants and machinery under the supervision of the Ministry of Industry.

"The Ministry of Industry has constantly implemented a policy aimed at reducing air pollution. It has, for example, stipulated that the exhaust systems of cars assembled in Thailand must be equipped with anti-pollution devices, or catalytic converters as they are called. The ministry has issued a regulation stipulating that vehicles with engines exceeding 1,600 cc must be equipped with this device starting 1 July 1993. As for cars with engines smaller than 1,600 cc, such devices must be installed effective 1 September 1993."

The minister of industry said that the ministry has issued standards for low-smoke engine oil. This goes into effect starting on 23 March 1992. Besides this, officials have discussed setting engine pollution standards, or engine emission standards, for car engines that use gasoline, car and machine engines that use diesel fuel, and motorcycle engines that use gasoline. These standards have already been drafted. The ministry is now seeking the opinions of businessmen and those concerned in order to tighten things. These standards will probably go into effect in the near future.

Prior to this, the Ministry of Industry implemented a policy requiring industrial plants in the country to reduce the use of CFCs [chlorofluorocarbon's], which are substances that destroy the ozone layer. They must use other substances instead. Also, the Petroleum Authority of Thailand must import and sell low-sulfur diesel oil.

### Environment Bill Passes Legislative Assembly

92WN0294A Bangkok BANGKOK POST in English  
18 Jan 92 p 2

[Text] A new environmental protection law giving wide powers to authorities to deal with environmental problems sailed through its first reading in the National Legislative Assembly yesterday.

The Environmental Protection Bill will also for the first time recognise the role of non-governmental organisations in environment protection.

The bill will replace three existing environment laws and provides promotional privileges in the form of tax exemptions to encourage industries to install treatment facilities.

During the 45-minute debate in the Parliament, most NLA members spoke in favour of the bill.

Pornthep Pornprapa said the bill would put all the various environment agencies under the same roof to improve coordination and efficiency.

He said environmental problems would be tackled more effectively in the future.

Another assemblyman, Pichai Vassanasong, said environmental destruction is a global problem which had to be addressed on a global scale.

"A problem which takes place in one area will have an impact on other places," he explained as he urged private business to demonstrate more responsibility in protecting the environment.

After the first passage of the bill, a 19-member scrutiny committee was set up to review the bill for seven days when it is due to be resubmitted to the NLA for the second and final readings.

The bill calls for the restructuring of environmental management with an emphasis on quality management.

An environment board will also be set up to direct a comprehensive anti-pollution network under a unified policy.

Wide-ranging powers will also be given to the board to be headed by the prime minister and comprising many Cabinet ministers, secretary-generals of the NESDB and BoI, as well as three representatives from the private sector.

The board can also suggest to the prime minister that he punish government agencies and state enterprises that violate the bill.

NLA member Dr Sompob Hotrakit pointed out that the bill does not clearly define the responsibility or role of the three new departments to be created by the bill.

The three department-level agencies would be created under the Science, Technology and Energy Ministry, which will be changed into the Science, Technology and Environment Ministry.

The three agencies cover pollution control, environment protection and planning and policy.

The pollution control agency, comprising the permanent secretary of the Science, Technology and Environment Ministry and director-generals of many powerful departments, will be led by the science, technology and environment minister.

In case of natural disasters or emergencies caused by pollution, the bill empowers the prime minister to order state agencies and enterprises to help the public affected by the incident, or to stop the violators from causing disaster.

Negligent owners of property that cause pollution will be held responsible.

As an example, land and rivers encroached on or damaged by the public will be declared as protected areas by the environment protection board.

Under this bill which covers a wide range of environmental issues, a fund will be set up with contributions coming from the Government and the private sector.

If passed into law, environment groups and NGOs working on environmental issues are entitled to seek registration which will give them legal status to assist authorities to enforce environmental laws and to seek state funds and assistance.

### Stop

The authorities also have the power to stop the use of vehicles, which include boats, that cause noise and air pollution.

Rights granted to the public under the bill include:

- To obtain information from government agencies on environmental protection and conservation;
- To claim compensation from the Government for any damages caused by government agencies or state enterprises;
- To file complaints with authorities against any acts that violate toxic control and environmental protection regulations.

Major types of pollution—of the air, water, and noise—would each be dealt with by a pollution control committee responsible for setting emission standards.

Heavier penalties and fines will be imposed on polluters and forest encroachers.

Those who discharge waste water without proper treatment will face a daily fine amounting to four times the regular expense of operating a water treatment plant.

Incentives in the form of tax cuts and tax exemptions have also been introduced for industries which import machines and knowledge to reduce pollution.

### Prime Minister Sees Active Role for Country at UNCED

*BK1003020592 Bangkok BANGKOK POST in English  
10 Mar 92 p 3*

[Text] Sustainable development can only be achieved when all nations act together as a unified force, Prime Minister Anan Panyarachun said yesterday in his keynote address at the international symposium on "Energy and Mineral Resources in the Circum-Pacific Region and Environmental Impact of Their Utilization" at Queen Sirikit National Convention Centre.

"Sustainable development can never be addressed fully unless we play our part in the international battle against environment degradation," he said, adding "for this

reason, Thailand is ready and willing to play an active role in the forthcoming United Nations Conference on Environment and Development which is scheduled to take place in Rio de Janeiro, Brazil, in June this year."

The Prime Minister cited some of the steps already unilaterally taken in Thailand which will contribute towards the solution of global environment issues. The measures include a logging ban, promulgation of a new comprehensive Wildlife Act, a new law on environment and the introduction of unleaded gasoline.

Environment degradation is one issue which cuts across national boundary and poses a real and imminent threat upon the future of mankind, he said.

"All of us have to share common natural endowments, which could be considered global heritage, ranging from the air we breathe, the water we drink, to the climatic conditions governing the way we live. It is through the upholding of this common heritage that sustainable development can be achieved," he added.

Integrating the ideas of sustainable development into daily operations is a great challenge for all sectors of industry but none more so than the energy and mineral resource industries since they are in the vanguard of environmental stewardship, said Prime Minister Anan.

"Development of new energy sources, production, distribution, transportation and consumption of energy, all have the capacity to create severe environmental impacts," he added.

The Prime Minister, however, reminded his audience that the reality of attaining sustainable development must not be lost behind its rich rhetoric.

"The reality entails making major changes in the way we organise our societies. Primarily, the values of sustainable development, when they are achieved, will change national and international attitudes toward consumption. Far-sightedness and prudent use of natural resources will have to replace excessive exploitation which has created many of our environmental problems," he said.

"The surging interest in environment should be viewed not as a burden to growth, but rather as an opportunity as well as a precondition for future growth itself. This requires not only the new approach on the part of government policy, but also a new and positive thinking on the part of the private sector and the general populace," said Prime Minister Anan.

"For the government, this will mean developing policies to promote the optimal use of resources ahead of exploitation and also by providing the framework through which other sections of society can adjust.

"For the private sector, the new concern and interest in environmental protection is readily translated into new business opportunities. Companies which understand the concept of sustainable development will be far more



likely to survive and flourish than companies which do not," said Prime Minister Anan.

**More Cambodian Border Crossing Points Opened for Transport of Timber**

*BK1403035692 Bangkok BANGKOK POST in English  
14 Mar 92 p 7*

[Text] The Interior Ministry has approved the opening of three more temporary border crossing points in Prachin Buri Province under the jurisdiction of the Burapa Task Force to speed transport of logs and prepared wood from Cambodia into Thailand, according to a source.

Burapa Task Force Deputy Commander Col Somchai Ubondetpracharak on Thursday met representatives of agencies involved such as the Forestry and Customs departments, local administrative officials and police and discussed the move.

The three crossing points are at Ban Sanlo Changan in Ta Phraya District's Tambon Thap Sadet, Ban Fao Rai in Tambon Ta Phraya of Ta Phraya District, and Ban Khao Din in Tambon Khlong Hat of Khlong Hat District.

The source said that in the past two years more than 11 Thai companies have obtained logging concessions from Khmer factions.

Logs and prepared wood have been transported to the border, awaiting permission to be brought into the country, the source said.

**Cabinet Approves Forest, Environment Protection Plan**

*BK1503080492 Bangkok Radio Thailand Network  
in Thai 1200 GMT 15 Mar 92*

[Text] Interior Permanent Secretary Anan Anantakun reported at today's press briefing that the Cabinet on 4 February approved a budget of 1,883.20 million baht for implementation of a program to preserve national forests and restore national water resources. The program will cover some 6 million rai of land in 60 areas of the four major water sources—Ping, Wang, Yom, and Nan—and will take five years from 1992 to 1996.

The interior permanent secretary said the project is considered high priority under the present situation where Thailand's forests and natural environment have been destroyed to the point that there is already an environmental imbalance. Thailand now needs to take a concrete step toward solving the problem immediately. The permanent secretary said the Interior Ministry will advise the provincial administration to cooperate with concerned agencies in implementing the program.

**VIETNAM**

**Premier Vo Van Kiet Bans Log Exports**

*BK2703074692 Hanoi Voice of Vietnam in English  
1000 GMT 26 Mar 92*

[Text] Premier Vo Van Kiet, in a dramatic move to end widespread logging in central and southern Vietnam, has ordered the Ministry of Commerce and Tourism and the Ministry of Forestry to stop allowing the export of timber and sawn wood and to withdraw all permits they have issued this year.

He also ordered provincial authorities to check the validity of permits issued to sawmills and to encourage brick makers and lime and pottery makers to use coal instead of charcoal and wood.

To redeem the situation the premier asked the Ministry of Forestry to clamp strict controls on logging and poaching.

**BULGARIA****Environment Minister Assesses Helsinki Ecoforum***AU2003082392 Sofia BTA in English 2012 GMT  
19 Mar 92*

[Text] Sofia, March 19 (BTA)—“I am coming back with two good pieces of news and two pieces which are not so good,” the minister of the environment, Valentin Vasilev, said on returning from Helsinki today. There he attended the conference of senior advisors of the Economic Commission for Europe on environment and water resources.

Mr. Vasilev's good news is that yesterday 22 countries signed two agreements—a Convention on the Protection and Exploitation of Transboundary Water Currents and International Lakes and a Convention on the Transboundary Effect of Industrial Accidents which the United States and Canada joined too.

The other good news is that European Community member countries expressed willingness to increase their aid for central and eastern Europe.

Romania refused to sign the convention on industrial accidents, while the former Yugoslav republics joined neither of them for political reasons. That was Mr. Vasilev's first piece of bad news, the second being that an increasing number of countries no longer rely on their own resources to solve their environmental problems and are all seeking foreign aid. “This will be one of the most difficult topics at the forthcoming conference in Rio de Janeiro,” Mr. Vasilev said.

**CZECHOSLOVAKIA****Slovak Parliament Deliberates on Environmental Problems, Energy Policy***AU2703102892 Prague HOSPODARSKE NOVINY  
in Czech 25 Mar 92 p 2*

[“jur”-signed report: “About Ecology, Power Generation, and StB [State Security]”]

[Excerpt] Although deputies voiced the promised protests against the vote of confidence in the minister for the administration and privatization of national property, I. Miklos, but nobody asked that it be repeated.

The opening of the second day of talks was dedicated to the environment in Slovakia. The deputies observed that the condition of the environment has not appreciably improved, and the local improvements are a result of the decline in industrial production.

The Slovak Commission for the Environment currently observes 15 regions that accumulated a particularly large

number of various ecological problems. Generally negative effects are evidenced in Bratislava and Kosice. The worst air pollution in Slovakia, resulting from the mining and processing of lignite with high content of arsenic, is in the Upper Nitra Valley. The situation in the Ziar basin and the Sered-Sala region is only marginally better. The last on the list of the threatened regions are the High and Low Tatras, and Velka Fatra with an excessive concentration of tourism in just a few localities. This fact is not always considered in discussions concerning Olympic games in Slovakia.

The Commission for the Environment insists that one of the fundamental criteria in drafting concepts of the economic sectors development should be the environmental criterion. The endeavors not to further devastate the environment and to create conditions for quick meaningful solutions should prevail. A radical change of attitude is needed particularly in energy generation, which is responsible for 64 percent of the discharge pollution. Metallurgy is another major polluter—according to realistic estimates, it annually releases 40,000 tonnes of solid emissions into the atmosphere. Among the enterprises that have the most negative impact on the environment are Slovak National Uprising Works in Ziar nad Hronom, East Slovakia Steel Mills Kosice, Sered Nickel Metallurgical Plant, and Kovohuty [Metallurgical Plants] Krompachy. The Slovak Republic Industry Ministry resort is not far behind—it needs 16 billion korunas for its environmental program.

The energy concept for the Slovak Republic up to the year 2005 also caused an extensive discussion. The Slovak National Council notes three reasons for the backwardness of the Slovak power production as compared to the developed industrial countries. The first of them is the power-demanding economic structure, then the disregard for the value correlations by the policy of “cheap energy” in the past, and the neglect of the impact on the environment. In addition, Slovak Republic Economy Minister Belcak pointed out the vulnerability of the Slovak energy supply stemming from the dependence on a single supplier of strategic raw material. At this time, the Slovak Republic obtains 68 percent of the inputs by imports from the former USSR and shipments from the Czech Republic.

The energy concept contains activities that will reduce the power consumption in the manufacturing sector by 25 percent in comparison with 1990. At the same time, however, in the tertiary sphere it will increase by 13 percent. The deputies recommended to the government that new sources be created only after all possibility of energy saving and alternative sources are exhausted. They confirmed the correctness of the orientation to the non-nuclear program. [passage omitted]

## HUNGARY

### Environmental Groups Protest Danube Dam System

AU1103145892 Budapest MAGYAR NEMZET  
in Hungarian 9 Mar 92 p 3

["Statements" by the Danube Circle and the Federation of Christian Intelligentsia "on the Bos Issue"; place and date not given: "The Interstate Agreement Has To Be Terminated"]

[Text] After the Slovak Parliament made its decision, the Danube Circle and the Federation of Christian Intelligentsia sent the following statements to our editorial office:

"The situation of the Danube has become critical again. On 6 March, the Slovak Parliament voted for continuing the construction at Bos, giving a snappy answer to Prime Minister Jozsef Antall's letter, which is an unacceptable answer for Hungary. There is no room for such exchanges of letters in the future.

"At the same time, the suddenly increasing number of signs in Hungary in recent days (mainly the stand taken by the Parliament's economic committee in opposition to the existing parliamentary decisions and the environmental committee's forward-looking proposals, and the secret negotiations of Environment Ministers Sandor K. Keresztes and J. Vavrousek in Budapest) indicate that, somewhere, at the pinnacles of power, a compromise is being prepared, which, in this issue, would mean a complete surrender and the betrayal of the ecological and Hungarian interests: These two interests coincide in this case.

"It seems that we also have to hold ourselves responsible for trusting the current ruling powers for too long. Under these circumstances, the Danube Circle is again calling everyone for a broad nationwide protest against the Danubesaurus [name given to the construction at Bos].

"Therefore, we demand that the Hungarian Government immediately terminate the 1977 agreement, which could be contested on many points from an international legal point of view! We also demand that Environment Minister Sandor K. Keresztes, who is mainly responsible for the Hungarian Government's delaying tactics and thus is considerably damaging the Hungarian side's negotiating position, be immediately discharged!

"If these demands are not met then the Danube Circle maintains the right to hold demonstrations in the interest of the Danube." The Danube Circle.

"It is Slovakia's and Hungary's fundamental political and economic interest that neither the original Bos-Nagymaros Water Barrage [BNV] system, nor any of its modified versions become implemented in the Danube valley. Filling it in should not even be attempted! In the meantime, the Slovak Government is continuing to

build the edifice, stressing the importance of completing the BNV. Demanding new research and investigations is only an excuse and playing for time; the real aim is to complete the construction in the meantime.

"We ask that, in order to clarify the situation and to avoid further blackmailing, the government unilaterally terminate the agreement immediately and agree with the CSFR Government on halting the construction and then restoring the natural conditions. We demand that the Hungarian, Slovak, Czech, and world public be informed professionally and extensively in the press! We demand that the two governments make use of the international financial support available for the purposes of environmental protection!" The Environmental Group of the Federation of Christian Intelligentsia.

### Parliament Discusses Terminating Hydropower Agreement

LD1003204192 Budapest MTI in English 1910 GMT  
10 Mar 92

[Text] Budapest, March 10 (MTI)—Hungary is compelled to unilaterally terminate the 1977 Czechoslovak-Hungarian agreement to build a power station at Gabčíkovo and Nagymaros unless certain conditions are met, said Hungarian Transport, Telecommunications and Water Management Minister Csaba Siklos today.

A draft resolution about the 1977 Czechoslovak-Hungarian agreement was discussed in the Hungarian parliament today.

After inter-governmental talks last December, the Czechoslovak government passed a resolution to complete the hydropower system and put it into operation. However, it rejected many Hungarian proposals to set up a joint investigating committee which would examine whether the project is at all environmentally safe. Also, it refused to grant Hungary's request to halt any work that fails to comply with the 1977 accords.

In a letter to his Czechoslovak counterpart, Hungarian Prime Minister Jozsef Antall called for immediately halting all construction counter to the 1977 accords. He also suggested launching a joint investigation with impartial experts.

Hungary has asked for backing from other states belonging to the Conference of Security and Cooperation in Europe, as well as other international organizations. Should the efforts fail to bring results, Hungary will be forced to ask parliament to scrap the 1977 bilateral construction treaty, Siklos said.

In terminating the accords, Hungary would inform Czechoslovakia of its readiness to cooperate in eliminating the consequences of the termination and to conclude a new inter-state agreement, he added.

Several parliamentary committees—economic, environmental protection, and foreign affairs—also backed the government proposal.

The Hungarian government's wait-and-see attitude about the Gabčíkovo-Nagymaros project was wrong, according to opposition MP [member of parliament] Janos Pap of the Federation of Young Democrats.

Terming the issue "a professional and scientific matter," Pap said an earlier report by the Hungarian Academy of Sciences provides a sufficient basis to make a decision.

According to the report, any plan to complete the hydropower system would endanger Central Europe's largest drinking water supply and disturb the region's ecological balance.

Any impatient move on Hungary's part is bound to drive Czechoslovakia into completing the dam under "Version C," which would be the most costly solution for Hungary, foreign affairs state secretary Tamas Katona said.

Under Version C, accepted by the Slovak government last January, the hydropower system could be put into operation in 1992—even if Hungary rejects a joint construction plan.

A mutually acceptable solution can be found only through negotiations sought with international participation.

Hungary's unilateral move may embitter Hungarian-Slovak relations for decades. The Hungarian government should patiently continue to seek a solution, Katona said.

The discussion was finally adjourned.

## YUGOSLAVIA

### Study Investigates Ground Pollution in Celje Area

92WN0380A Ljubljana DNEVNIK in Slovene  
10 Mar 92 p 3

[Article by Mica Vipotnik: "Lettuce With an Aftertaste of Metal"]

[Text] Studies of ground and plant pollution in Celje were done first of all; studies will follow in Krsko, Ptuj, Jesenice, Ljubljanska Kotlina...

Ljubljana, 10 Mar—Slovenia is still the jewel of Europe. We have exceptional opportunities to obtain irreproachable food, but not in the vicinity of industrial centers. In areas where there is industry, we should plant plants that absorb smaller amounts of toxic substances, "we were told by Prof. France Lobnik, the head of the Agronomy Department at the Ljubljana Biotechnical School, who is also at the same time the head of a group of scientists that has studied the pollution of the ground and vegetation in the Celje region, and in the future will also do the same in Krsko, Ptuj, Jesenice, Koper, and Ljubljanska Kotlina. The studies in the Celje region showed that the ground in the center proper absorbs too much cadmium, lead, and zinc, and in certain areas there are somewhat increased amounts of fluorides,

arsenic, and nickel. In some places there are increased but not critical amounts of organic substances such as triazines, DDT, DDE, and TDE.

The toxic substances pass from the ground into plants, and consequently it is necessary to determine the presence of harmful substances in edible plants. This particularly applies to cadmium and lead, which are harmful to humans even in concentrations at which there is no visible damage to plants. It is a different story, for instance, with zinc, copper, and nickel, which do not harm humans and animals in concentrations at which they have a harmful effect upon the quality and quantity of a crop. The amounts of cadmium and zinc that were discovered in the Celje soil, of course, are not yet alarming, and even if someone eats a dandelion on several occasions, which he is advised against doing because of pollution, he will still not become ill; but the long-term use of plants polluted with heavy metals can cause poisoning. "I would not advise raising lettuce, radishes, and spinach in the center of Celje proper, but in the broader Celje region this fear does not exist," Prof. France Lobnik stated. In fact, all plants do not absorb all elements equally. The amount of the toxic substance that the plant absorbs also depends upon the type of soil.

Sandy soil yields more heavy metals than clay soil, which retains them.

The vegetables that accumulate the most heavy metals include lettuce, spinach, artichokes, endives, cress, the leaves of turnips, and carrots; somewhat less is absorbed by kale, beets, turnips, small radishes, potatoes, and onions; and little or very little heavy metal accumulates in cabbage, corn, Brussels sprouts, cauliflower, greens, strawberries, beans, peas, melons, tomatoes, paprika, and fruit. Consequently, in the center of Celje, if people do grow things, they should grow the plants that will absorb the least heavy metals. Celje, however, is quite certainly not the only city in Slovenia that is polluted with heavy metals. Subsequent studies will probably reveal more like this. First of all it is necessary to draw a pedologic map (of the type of soil) of all of Slovenia, and then study the content of toxins in the ground. This will be an important guidepost for our agriculture.

The first legislation in this field also emerged on the basis of the Celje study: the "Decree on Determining the Pollution of Agricultural Land and Forests," and the "Regulations on Normative and Analytical Procedures and Methods for Determining Pollution in the Ground and Vegetation, and the Conditions for the Use of Certain Substances in Agriculture and Forestry."

"Pollution is a multidisciplinary problem, and consequently cooperation among different experts is necessary. Our research group, in addition to experts from our school, also includes experts from the Boris Kidric Institute and the University Institute for Health and Social Security in Maribor. It was precisely with the Celje model that we determined that the results could not be clarified without different experts," Prof. France Lobnik also told us.

## REGIONAL AFFAIRS

### Colombia, Ecuador Conclude Environmental Treaty

PA1403182292 Santa Fe de Bogota EL NUEVO SIGLO in Spanish 10 Mar 92 p 1B

[Text] Colombia and Ecuador have signed a treaty on environmental matters. The delegations from the two nations met during the 7 March weekend in Pasto, Colombia to establish joint actions in the ecological field.

After analyzing the proposals presented at the 7 March meeting, the delegations from both nations will meet again in June to implement jointly the actions related to the environmental situation along both sides of the border.

Mayors from the border municipalities, educational and health authorities, and the Armed Forces have been summoned to the June meeting.

The personnel training program will be first so the integration programs within the Andean Group can subsequently be implemented.

A number of joint actions will be identified and enforced aimed at fostering adequate environmental guidance to achieve the reasonable use of natural resources while protecting the environment.

There will be an effort to encourage the exchange of information between mayors and representatives of other sectors aimed at fostering intersectorial and binational agreements.

The June meeting will be hosted by the Program for the Environment and for Social Development of the Andres Bello Treaty's Executive Secretariat, the Konrad Adenauer Foundation, the Corporation Promoter of Communities of Colombia, the National Department of Planning, the Foreign Ministry, the Mayor's office in Pasto, the Ecuadoran Embassy in Colombia, and Colombia's Embassy in Quito.

Within the integration framework, the Andres Bello Treaty has been encouraging these types of meetings with the different sectors along borders of the Latin American nations that are signatories of the Cartagena Agreement, that is: Bolivia, Colombia, Chile, Ecuador, Panama, Peru, and Venezuela.

The binational agreement between Colombia and Ecuador opens the way to a number of border programs with other nations to implement the agreements signed by the region's presidents during the several meetings held last year.

The Cartagena Agreement Board has observed with great interest this step by Colombia and Ecuador because it considers this a way to bring about integration.

### Paraguay, Argentina Sign Declaration on Building Hydroelectric Dam

PY1403192492 Asuncion ABC COLOR in Spanish 14 March 92 p 9

[By special correspondent]

[Text] Buenos Aires—Paraguayan President Andres Rodriguez and Argentine President Carlos Saul Menem last night signed a 5-point joint declaration. In the declaration, the two presidents commit themselves to building the Corpus hydroelectric dam and another bridge over the Parana River that will unite the towns of Presidente Franco [Paraguay] and Iguazu [Argentina].

The joint declaration signed by President Andres Rodriguez and Argentine Carlos Saul Menem states in its first point that the chiefs of state have expressed their satisfaction over the exchange of notes on 9 January that will allow for the conclusion of the Yacyreta binational project and the start of operations according to the established timetable.

The joint declaration states in its second point that they express their categorical support for the continuation of studies on the building of the Corpus binational hydroelectric project which will help to achieve vast and ample integration in the energy area within the framework of the Mercosur [Common Market of the South].

The third point establishes the instruction of the foreign ministers of the two countries to sign notes on the streamlining and duties of the Parana River Joint Commission (Comip) on the occasion of the Rio Group meeting to be held in Buenos Aires.

The fourth point establishes that during the Rio Group meeting, the Paraguayan and Argentine foreign ministers will invite their sister nation, Bolivia, to formally adhere to the tripartite agreement on the multiple exploitation of the Pilcomayo River basin to seek a joint solution aimed at halting the regression of the Pilcomayo River basin.

In its fifth point the joint declaration expresses support for feasibility studies being carried out on the building of a bridge on the Parana River in the Iguazu region through a system of concessions for the building and exploitation of public works [bajo el regimen the concesion de obras publicas]. This will help to strengthen the existing friendship and integration ties between the two countries.

Before Menem and Rodriguez signed the joint declaration, Argentine Foreign Minister Guido di Tella told journalists yesterday that the delays and cost increases that the Yacyreta project experienced cannot be tolerated in the building of Corpus.

Di Tella said: "We have learned from the difficult experience of Yacyreta, which lasted too many years and experienced too many complications and cost increases,



that we cannot repeat this experience. I believe that private business is the right answer to the Corpus project."

Asked about the Argentine Government's position regarding Corpus, he said: "We will not support any solution that does not include private business with the full backing of the respective governments." He added that this "is the Argentine Government's policy; and I believe it is also the policy upheld by the Paraguayan Government."

Di Tella also said: "I believe there will be no disagreements in that the construction must be carried out by private investors."

After his arrival in Buenos Aires, Rodriguez said that the continuation of the construction of the Yacyreta dam is a fact. Asked about a statement made by Menem who said that "Yacyreta is a monument to corruption," Rodriguez said: "That was before, but several measures have been adopted, and I believe this situation has changed."

As an example of these measures, Rodriguez said that both Paraguay and Argentina have implemented a large cut in the number of management personnel.

Asked if Paraguay is interested in purchasing gas from Argentina, (through a gas pipeline), Rodriguez did not reject this possibility, but he declined to comment further.

Moreover, tomorrow Rodriguez will attend the Latin American Jockey Clubs grand prix race at the San Isidro racetrack. According to sources close to the presidential entourage, he is scheduled to return to Asuncion on 15 March.

Through Decree No. 12,868 issued yesterday, General Orlando Machuca Vargas was appointed acting president while President Rodriguez is out of the country.

## BRAZIL

### Lutzenberger Shares Views on Progress in Environmental Policy

92WN0328A Sao Paulo O ESTADO DE SAO PAULO  
in Portuguese 17 Feb 92 p 9

[Interview with Secretary of Environment Jose Lutzenberger by AGENCIA ESTADO reporter Elza Pires; place and date not given: "Secretary Expects Aid From First World"]

[Text] Environment Secretary Jose Lutzenberger is convinced that the rich countries are going to help the poor countries pay for a sustainable development program, because we have only one planet and it is threatened. "We are all on board the same ship," he tells AGENCIA ESTADO correspondent Elza Pires. He insists that an

evolution has already taken place in the way environmental problems are dealt with both in Brazil and in the rest of the world.

After more than two years as head of the Secretariat of Environment, Lutzenberger acknowledges that some progress has been made in Brazilian environmental policy but believes it is too soon to celebrate. Although he is convinced that the deforestation has lessened, he continues to advocate a moratorium on land clearing as a way to halt the devastation of the forests.

[Correspondent] After the Manaus conference, at which a common position was formally adopted by the eight countries of the Amazon Pact, how do you view the question of international cooperation and the sovereignty of the countries that have tropical forests?

[Lutzenberger] We are all on board the same ship, the same planet. It is entirely in the interest of the rich countries to help us. As for those who believe that modern types of aid constitute an attack on our sovereignty, it is because they do not want to do certain things. The Manaus agreement represents evolution. Mankind has come to understand that we cannot continue down the road of the "industrial society"—the road of unbridled consumption.

[Correspondent] What policies should Brazil follow in order to comply with the guidelines of the Manaus Charter?

[Lutzenberger] If there is a genuine intent to preserve the Amazon Region, we must immediately embark on a policy that is quite different from the one that is still being pursued. I have been saying this from the very first days of this administration, but it is difficult for many people to accept. Certain organs of government, such as the Ministry of Agriculture, are not acting in accordance with any paradigm, any particular type of thinking. As a result, they do not have the capability to do these things. We have in the Amazon today—as seen by satellite—a total of 400,000 square km that have already been deforested. In the state of Rondonia the deforestation is already horrible, while in Roraima it is just beginning; and the state of Para has been violently eroded away. Our deforested area is as large as Spain. People cut and slash, abandon the cutover area, and continue to cut and slash. The big cattle ranches are cutting down between 10,000 and 20,000 hectares and planting pasture.

[Correspondent] What do you think might be done?

[Lutzenberger] On these 400,000 square km we need to teach small farmers crop-growing techniques that are sustainable and regenerative. Through the Gaia Foundation—an institution that some persist in calling a "gigantic international conspiracy"—I personally am carrying out an interesting program in southern Para State, where we are teaching 50 or 60 families to rotate crops and interplant them with legumes. We teach them how to obtain certain products from the forests without destroying the forests, and we are finding a market for

these products in Europe. The program is proving to be a great success, but it is being carried out by a private foundation and by me personally, using my own money and small donations we receive from Europe. This type of thing ought to be done by government organs such as EMATER [Technical Assistance and Rural Extension Enterprise]. The cattle ranches in the Amazon are the most stupid and imbecilic thing imaginable. We must begin to grow perennial crops on those ranches. We have to restore those forests.

[Correspondent] How can the devastation be controlled?

[Lutzenberger] In my view, we would not need to cut down so much as another single square km of forest. We shall work on the surface of the areas that have been cut down. Only in this way will we be able to preserve the remaining forest. There should be a moratorium for a number of years to enable us to save what remains. There is one thing we must control, however, and that is the lumber dealers. That is the biggest scandal of all. I found out that Ibama [Brazilian Institute for Environmental Affairs and Renewable Resources] itself, with respect to this lumber question, had been operating until now as if it were nothing but an agency of the lumber dealers. The forest permits that were issued and the so-called forest-management plans—which are pure humbug—were being used only for exploitation of the timber.

[Correspondent] Are there other ways to control the devastation other than by carrying out inspections?

[Lutzenberger] We must demarcate the Indian areas and protect the native populations. In the case of the gold miners and the extractive reserve, demarcation will not suffice. We have to find a market for them.

[Correspondent] But hasn't the devastation been lessening in the past several years?

[Lutzenberger] In 1987 an area the size of Portugal was devastated: approximately 90,000 square km. In 1990 the figure dropped to 14,000 square km—a decrease of 80 percent. The data for last year will be released within the next few days. No one knows for sure yet, but I expect that the figure will be around 8,000 to 9,000 square km.

#### **Space Mapping Identifies Amazon Investment Areas**

92WN0328C Rio de Janeiro O GLOBO in Portuguese  
18 Feb 92 p 16

[Article by Special Correspondent Elisa Andries]

[Text] Belem—The initial areas of the Amazon Region that will obtain investments for projects of sustained development are already being selected by means of space mapping of the region. The mapping is part of the first stage of the Amazon Development Plan (PDA),

which is coordinated by the Authority for Developing the Amazon Region (Sudam).

The PDA—which cites incentives for science and technology as providing the only viable solution for the problem of the development of the region—was discussed yesterday at the International Seminar on the Environment, Poverty, and Development of the Amazon (Sindamozonia) held in Belem.

The objective of the PDA is to have the entire process of setting up the projects for sustained development directed by the local residents, Sudam Regional Superintendent Alcyr Doris Meira explained.

The greater part of the funds necessary for setting up the PDA projects will be supplied by the Group of Seven—formed by the seven richest countries in the world—which recently approved the Program of Financial Cooperation for the Preservation of the Amazon Region, which provides for the release of \$1.5 billion over the next five years. A total of \$50 million has already been released and used for the mapping program.

#### **More Attention to Eco-92 Preparations Urged**

92WN0328B Sao Paulo GAZETA MERCANTIL  
in Portuguese 21 Feb 92 p 4

[Editorial: "Eco-92, Brazilian Responsibilities"]

[Text] The preparatory work for Eco-92—the UN Conference on the Environment and Development—deserves more and better attention from Brazilian government officials involved with the conference, which will be held next June in Rio de Janeiro.

There are a variety of clear indications that a myriad of basic measures—ranging from the housing of the delegates to the logistic infrastructure in support of the work of the conference—are being put off until the last minute. Important details concerning the participants in certain meetings, the organization of documents, and the preparation of reports also require closer attention.

It is already known that the participation of heads of state will not be as meaningful as had been expected, for there will be important absences including those of the presidents of the United States and France, which have been virtually confirmed.

Inasmuch as some time ago the political and administrative activities of the governments of the state of Rio de Janeiro and the municipality of Rio ceased to have any direct connection with Eco-92 in order to adopt their own course and acquire their own influence (not always with a view to providing additional support for this important event), what we are left with today is the imperative necessity of doing well (and speedily) everything that remains to be done.

This is the exclusive responsibility of the Brazilian organizers. To strengthen their resolve, they should turn

to the good examples of coordination and qualification for cooperative labor that have recently been set by Brazilian diplomats.

In a specific instance that relates to the environment, namely the recently completed Declaration of Canela (which the five countries of the Southern Cone will take to Eco-92 as their joint position), the Brazilian delegation demonstrated the flexibility and the sense of accommodation that are essential when partners with common goals sit down at the table.

Brazil, as is known, had wanted a thesis dear to the current administration—namely, the thesis that there is an intrinsic linkage between the environmental question and the question of sovereignty with respect to debt—to receive prominent mention in the final declaration. That will not occur, however. The matter will be mentioned, but only in a passing reference.

The Argentine position—which also had the support of Uruguay, Paraguay, and Chile—accordingly prevailed. The Argentine position was that it is more important to create a portfolio of actions oriented toward the future—toward conservation and preservation of the environment—rather than attempt to make an accounting of the damage caused to nature, in the past, by the developed nations.

This is a schematic way of treating the question, but what is important in the present case is the unequivocal demonstration that the nations involved felt themselves capable of obtaining a consensus; worked to obtain it; and formed a cohesive front to present it in a larger forum.

Argentina, Brazil, Paraguay, and Uruguay—the founders of Mercosur [Common Market of the South]—have given proof on other occasions that the proverbial Latin American individualism can be overcome when there is a genuine political desire (and objective, immediate, and concrete reasons) to see it replaced by the kind of joint effort that has, for example, brought so many benefits to the members of the European Economic Community.

The Brazilian preparations for our participation in the Declaration of Canela were comprehensive and meticulous. The Brazilian proposal contained no fewer than 55 points, a number of which played a prominent role in the drafting of the joint declaration. Others, as we have seen, were replaced by what the consensus deemed to be more pertinent.

What is important now is that the example of Canela provide inspiration for results on broader fronts, beginning with the organization of Brazil's participation in Eco-92.

### **Norway Wants To Contribute to Brazil Environmental Projects**

*PY1803144292 Brasilia Radio Nacional da Amazonia Network in Portuguese 1000 GMT 17 Mar 92*

[Excerpts] The Norwegian Government wants to contribute to financing Brazilian environmental projects and helping the country achieve sustained development. Prime Minister Gro Brundtland, who is paying an official visit to Brazil, made this proposal to President Collor. In a working meeting at Planalto Palace, the prime minister also told President Collor that her country is willing to contribute financially to Brazilian programs aimed at assisting street children and thus contribute to reducing violence.

According to Foreign Minister Francisco Rezek, if Brazil wants to receive financial assistance, it will have to create a special fund for this with UNICEF's assistance. On her second day in Brazil, the Norwegian prime minister will visit Juscelino Kubitschek's memorial in Brasilia and grant a news conference at Itamaraty Palace. [passage omitted]

At 1500, she will leave for Manaus and then travel to Venezuela.

On 16 March, President Collor hosted a dinner honoring Prime Minister Brundtland. In his welcoming speech, the president emphasized the importance of the work she has been performing in favor of the environment and sustained development. Collor also commented on current social imbalances and pointed out to the prime minister that we cannot have an environmentally healthy world, unless we make it socially fairer.

### **President Collor Dismisses Environment Secretary, Ibama President**

*PY2103175492 Rio de Janeiro Rede Globo Television in Portuguese 1600 GMT 21 Mar 92*

[Text] President Fernando Collor dismissed Environment Secretary Jose Lutzemberger this morning. Education Minister Jose Goldemberg will be acting secretary until the end of the UN Conference on Environment and Development [UNCED].

Lutzemberger's dismissal was first considered in the middle of the week.

On 19 March, Secretary Lutzemberger gave a news conference to deny having tendered his resignation and say that there was a campaign at the Brazilian Institute for Environmental Affairs and Renewable Natural Resources [Ibama] to destabilize his administration. He added that he knew about corruption charges inside Ibama.

[Begin Lutzemberger recording] The Ibama department that controls sawmills and lumber companies has been working as a subsidiary of the sawmills and lumber

companies. The department hands out blank forms for industry businessmen to sign. [end recording]

Ibama directors reacted to these charges. They said all charges had been investigated and the employees involved in them dismissed. Upset about Lutzemberger's charges, Ibama President Eduardo Martins and all board members tendered their resignations. Ibama employees supported the board members' decision and filed a petition to the courts requesting that the environment secretary clarify his charges.

As a result of this confrontation between Lutzemberger and Martins, President Collor decided to dismiss both of them. The president of the Republic signed their dismissal this morning during a meeting with Presidential Secretary General Ambassador Marcos Coimbra.

Goldemberger will be responsible for the Environment Secretariat until the end of the UNCED. After being installed on 23 March, he will appoint a new advisory team.

#### **Acting Environment Secretary Appoints New Ibama Head**

*PY2503032092 Rio de Janeiro Rede Globo Television in Portuguese 2300 GMT 23 Mar 92*

[Summary] Today Education Minister Jose Goldemberger took over the concurrent post of acting environment secretary, replacing Jose Lutzemberger and presented the new president of Ibama [Brazilian Institute for Environmental Affairs and Renewable Natural Resources]. The new head of Ibama is Maria Tereza Jorge Paduay, an ecologist, who worked with the minister at the Sao Paulo Electric Powerplants Inc.

#### **Deforestation of Amazon Rain Forest Decreases 20 Percent**

*PY2803142492 Brasilia Voz do Brasil Network in Portuguese 2200 GMT 27 Mar 92*

[Summary] According to the National Institute of Space Research, the deforestation of the Amazon rain forest in 1991 was 20 percent less than that of 1990. Two years ago, the deforested area in the Amazon region totaled 13,800 square kilometers. This total decreased to 11,100 square kilometers last year, which is 0.1 percent of the entire Brazilian Amazon region. This means that a total of 8.7 percent of the rain forest has been destroyed.

### **PANAMA**

#### **President Endara Accused of Jeopardizing Canal's Ecology**

*PA2803232792 Panama City EL PANAMA AMERICA in Spanish 28 Mar 92 p 5A*

[Article by Eduardo Soto]

[Text] Legislator Leo Gonzalez said on 27 March that Panama is not complying with the Torrijos-Carter

Treaties wherein it is established that Panama must preserve the forest reserves in the Panama Canal's hydrographic basin, while he criticized President Guillermo Endara for allowing the destruction and harmful use of the reverted areas.

According to the MOLIRENA [Nationalist Liberal Republican Movement] legislator, the 1977 treaties point out that it is Panama's responsibility to prevent the ecological devastation of the canal basin. Gonzalez claims that this is not being done, as the authorities are allowing "squatters to invade" these areas "by the hordes."

Gonzalez said: "Makeshift houses are springing up like mushrooms," in the reverted areas.

Gonzalez' statements coincide with charges made by a group of Panamanian businessmen with regard to the devastation of 500 hectares of forest land in the reverted area, less than eight miles from downtown Panama City.

Forest land that comprises the canal basin in Lake Alajuela, Colon, Chilibre, Arraijan, and now in the capital have been cleared by peasant squatters.

Leo Gonzalez, who belongs to the Legislative Commission for Panama Canal matters, criticized the Presidency for dragging its feet with regard to canal issues, and said that the president is addicted to creating commissions. Gonzalez rejects the idea of creating "commissions and more commissions" without "making a definite decision."

According to the legislator, President Endara should make his own decisions, create the necessary institutions, and stop putting off a situation that is placing the future of the canal in danger.

Meanwhile, Panamanian President Guillermo Endara rejected Gonzalez' statements and said that the legislator was mistaken to think that the issue should be dealt with only by the Presidency without taking into account the other sectors.

"I am not party to that kind of action," stressed the president, who issued a decree on 27 March creating a new "Presidential Commission on the Authority of the Interoceanic Region." The commission is preparing a draft bill to create, organize, and regulate the state institution that will administrate the canal after the year 2000.

Representatives of the nation's five political parties as well as Panamanian businessmen and diplomats will participate in this commission.

The president did not include in the commission representatives of the labor sector or members of other sectors to avoid dragging out of the discussions.



## REGIONAL AFFAIRS

**Book Examines Near East Water Problems**

92WN0357A London AL-SHARQ AL-AWSAT  
in Arabic 23 Feb 92 p 8

[Review by Khadijah Anis of book *Al-'Amn al-Ma' al-'Arabi (Arab Water Security)* by Hasan al-'Abdallah, Center for Strategic Studies, Research, and Authentication]

[Text] For 43 years, the Middle East has experienced a series of conflicts at all levels, crowned by the Palestinian issue, which has come to be known as the "Middle East crisis" since the inception of the Hebrew state in 1948 and the consequent wars with the Arabs. The search for a solution in the region by Western presidents and foreign ministers, the Americans in particular, has culminated in success by James Baker, the current U.S. Secretary of State, in persuading all parties to the conflict to sit at the direct negotiating table at the Madrid Conference held on Wednesday, 6 November 1991.

Analysts of the Middle East crisis unfailingly focus on its political aspects without discursing, at least diligently, on the water issue, which has been contentious since the 1960s and is a chronic problem that could impede peace in the region.

The Center for Strategic Studies, Research, and Authentication has recently published a book titled *Arab Water Security*. Its author, Hasan al-'Abdallah, a student of demographics, economics, and development, has written several books on the Arab crisis, including *The Policy of Jewish Settlements in Occupied Arab Territories*, *Nazi Zionism*, and *Economics of the Lebanese Civil War*.

*Arab Water Security* deals with the Middle East water problem, which has become one of the most important elements of the Arab-Israeli conflict. The Arab-Israeli conflict was previously in the form of armed conflict, but has now taken the form of a political struggle at peace negotiations. Israel has controlled the waters of the West Bank and Gaza since 1967, and the Jordan River tributaries since 1965, which means that a considerable portion of Arab water resources is under occupation control. Consequently, in the words of the author, Israel poses a threat to the "water security" and "food security" of Arab countries. Israel annually steals 1,300 billion cubic meters [m<sup>3</sup>] of water from outside the occupied lands, usurps 660 million m<sup>3</sup> from Jordan River sources, and draws about 400 million m<sup>3</sup> of al-Litani River waters.

In light of all this, Hasan al-'Abdallah attempts in his book to survey the components and elements of the problem and trace their development, while focusing on the major axes and on the dangers that threaten Arab water resources. He begins by establishing a relationship between Arab water security and food security, in view of the importance of rationing water resources and

exploiting them to close the widening food gap. Noteworthy is that the Arab Center for the Study of Dry Regions and Arid Lands has warned of the onset of a water shortage that will peak at the end of this century, when the population of the Arab world will have increased from 170 million to 295 million. This naturally means that the demand of Arab nations for every drop of water will accelerate horrendously. The author therefore believes that, in order to deal with the problems of water security, and consequently food security, it is necessary to embark on major investment projects to store and transport irrigation water, build dams at strategic sites, and protect those dams by military means.

The author points out that water will surpass oil in future importance and that development projects in Arab countries were unfortunately not accorded the importance they deserve because the focus has always been on political and security considerations. Water is the most significant impediment to the course of the Middle East and will be, in the author's words, at the core of increasingly intense conflicts. In that regard, he touched on Arab-Turkish stands that are fraught with alienation, cross-purposes, and philosophies. Turkey controls the source of the Euphrates River and believes that being the only source of the river that flows into other countries gives it an unrestricted right to all of the Euphrates waters that it needs. Turkey also believes that talks should deal with water exploitation projects rather than with water sharing. Iraq and Syria, on the other hand, hold that they are partners with Turkey in the source and that the river also has other sources and tributaries within their borders. They consequently demand that the river be divided as soon as possible, prior to completion of the Southeast Anatole Dam project (22 Turkish dams) which would consume most of the Euphrates River waters at the expense of the two countries' shares. The threat of Turkey's plans was manifested in a water agreement that it signed with Israel in March 1990 to supply the Gulf countries and Israel simultaneously and using the same network.

The author then touches on the Nile River problem and on Egypt's relations with the other eight nations that control the river, i.e., Sudan, Ethiopia, Kenya, Uganda, Tanzania, Zaire, Rwanda, and Burundi. Water security is Cairo's principal concern and a major component of its African policy. When the Egyptian Government began constructing the High Dam project, Ethiopia dispatched a memorandum to both Egypt and Sudan, in which it pointed out its entitlement to waters of the Nile, which has its source within Ethiopia's borders. Noteworthy is that Egypt is doing its utmost, within what it calls Egyptian "water and water security diplomacy," to avoid any escalation in that regard. Perhaps the Egyptian foreign ministry's report on Egypt's water relations with countries of the Nile basin is proof of that. The report not only deals with Egypt's water security issue, but also with Arab security, and suggests possible solutions. Egypt emphasizes that the nine countries must join together in one river basin and should avoid bilateral



deals. Egypt could not, for instance, arrive at an agreement with Kenya without first consulting with the remaining countries and vice versa. Agreements have to be collective [multilateral] and not bilateral, although this makes matters more difficult, since any resolution would have to win the unanimous support of all nine countries. This is not easy, since the vital water issue is involved. Egypt, also in that context, has called for the formation of a bloc of Nile basin countries to be called "Undugo" (which means brotherhood in Swahili) to facilitate consultation and coordination in order to foster relations of economic and social cooperation to the benefit of all Nile basin countries.

Arab water security is a fundamental and sensitive issue that should be handled with diligence and care. The state of Arab water resources and the germane human, economic, and political factors insistently bring up the issue of "water security," which is linked to "food security." Then there are Israeli designs on Arab waters. Israel controls the waters of the West Bank, the Gaza Strip, and the Golan [Heights]. Only the al-Litani and Yarmuk rivers have escaped its influence. Any Israeli attempt to interfere with them, according to the author, would doom peace and security in the region and could be the spark that ignites future Israel-Arab conflicts, especially if Israel proceeded with its plan to divert some 400 million m<sup>3</sup> of al-Litani River waters to its lands.

## PALESTINIAN AFFAIRS

### Gaza Strip Environmental, Health Problems Detailed

92WN0349A Nicosia *FILASTIN AL-THAWRAH*  
in Arabic 1 Mar 92 pp 10-11

[Text] Before the Palestinian delegation [to the peace talks] left for Washington last week, the occupation authorities summoned Dr. Ahmad al-Yaziji, detained him for some time, and questioned him about the lecture he delivered at the UN seminar held in Nicosia 20-24 January. The following is text of the lecture:

As is known to everybody, the Gaza Strip is that narrow coastal strip that is no more than 45 km long, 6-8 km wide, and has a total area of 360 square km.

More than 750,000 people live in this small area of land. The Gaza Strip does not have an accurate population census, due to deliberate action by the occupation authorities.

Population density in the Gaza Strip is the highest in the world, with 1,800 persons per square kilometer. This would be much higher if we take into consideration the fact that 30 percent of the Gaza Strip's area is taken up by settlements, whose known total is 16; and areas occupied for security purposes. With the high population growth, which is about 4 percent, the Gaza Strip's inhabitants will reach more than 1 million during the

coming decade, which would further aggravate the population problem, with the rate of settlement building continuing as it is now.

Demographic problems, coupled with poor economic conditions and unemployment, have led to a serious health situation and to innumerable health problems. The number of visitors to clinics is more than 8,000 patients a day, for whom no acceptable minimum health services are available, due to the large crowds to be attended to by doctors, in addition to shortage in diagnostic capabilities, medicines, etc.

This introduction is necessary in order to perceive the extent of the health problems from which citizens in the Gaza Strip are suffering.

Any place in the world with such a high population density, psychological pressures, economic situation, and lack of environmental services because of indifference and neglect of the health situation by the authorities, can only lead to an extremely grave health situation.

The following are examples:

#### Water:

The acute water shortage in several areas of the Gaza Strip and the increase in salinity and organic and chemical deposits has rendered many wells unsuitable for human consumption. Yet the inhabitants continue to use such water because of refusal to allow drilling of alternative wells. This is a means of pressure by the Israeli occupier aimed at forcing the inhabitants to use the water supplied by the Israeli company "Meqarot", which exploits the underground water of the Gaza Strip itself in order to obtain this water. Often this water is diverted from the Gaza Strip to the interior of Israel, which further exacerbates the water problem.

#### Sewage:

Sewage disposal is the biggest problem of all. The present situation is indescribably bad. It is inconceivable and unacceptable, as we are on the threshold of the 21st century, that sewage disposal could be in the state described below:

1. Some 90 percent of the Gaza Strip's residential areas lack public sewage systems. Even those areas that have old and eroded sewage systems [sometimes] explode, causing the sewage to spill everywhere. The system's junction points and basins are very close, indeed in the midst of, residential areas. Sewage reservoirs are not treated with modern methods, thus becoming a source of health risks, insect breeding, and contamination of subterranean waters.

2. Areas outside the refugee camps depend on absorption wells for sewage disposal. The soil around these wells has become saturated and therefore useless, thus causing the sewage to overflow onto the streets and making the residential areas look as if they are swimming in pools of sewage.

3. The problem outside the camps is even more widespread and more serious, since sewage water is disposed of through open gutters that terminate at the sea shore. Children swim and play close to the mouths of these drainage terminals, which poses a serious health hazard for them. The occupation authorities and the municipalities, whose budgets are controlled by the internal affairs directorate under the occupation authorities, do nothing to resolve these problems.

#### Refuse:

Refuse is not collected on regular basis and is left to accumulate in residential areas, around houses, and in squares, thus creating endless health problems.

#### Environmental pollution:

The poor economic situation and the inhabitants' desire to earn a living and to progress and develop has led to the introduction of several primitive industries that generate pollutants. For this reason, these industries have been banned in Israel and were brought to the occupied territories, especially into the Gaza Strip. These primitive workshops have been established in the midst of residential areas, because of the nonexistence of industrial zones outside the towns and villages. It is also because such areas are occupied by settlements and by military zones that are off-limits. The same thing can also be said about bringing in old vehicles that pollute the air, and the pollution is aided by the lack of trees. This is also due to the expansion of the urban areas at the expense of agricultural lands for the reasons just mentioned, namely the high population density and the seizure of land by the occupation authorities.

Now after this review of environmental problems, we move to health problems in general. The Gaza Strip suffers from many contemporary diseases, such as blood pressure, diabetes, and blood diseases because of psychological and social pressures. It also suffers from contagious diseases.

It is true that pursuing the policy of immunization recommended by WHO has led to reducing some diseases, such as polio and measles, but on the other hand, various diarrheal diseases, bronchitis, tetanus, and various skin diseases still exist widely. This is in addition to various types of parasitic diseases. Research has shown that about 80 percent of the children are infected by one or more types of worm diseases. Research on gum and teeth problems has underlined the seriousness of the situation, since not a single schoolchild among those tested was free of gum and dental diseases.

The rate of anemia among pre-school children has reached 70 percent, and among pregnant women more than 60 percent. Malnutrition of various degrees is spreading among children under five years old, reaching about 50 percent. Asthma cases are increasing in number and in gravity due to the Israeli army's excessive use of tear gas in residential areas, and often inside closed houses.

What type of medical services are being provided to the inhabitants? Government medical services, the UNRWA [UN Relief and Works Agency for Palestinian Refugees], and private medicine.

We will concentrate on government health services since, in actual fact, they are responsible for the citizens' health in the occupied territories and they are fully responsible for that. Health services are divided into the Hospitals Branch and the Public Health Branch.

Government hospitals

Hospital Name	Number of Beds	Number of Doctors	Nursing Staff
Dar al-Shifa'	450	137	280
Nasir	213	67	135
al-Nasr Children's Hospital	135	39	56
al-'Uyun Hospital	35	8	13
Psychiatric	37	4	15
Total	870	255	499

A first glance at this statistic would show that there is one bed for every 862 people, one doctor for every 3,000 people, and one nurse for every 1,500 people. But if, for example, we take the number children's beds (135) and know that 50 percent of the population is under 15 years old, then it would show that there is one bed for every 3,000 persons, one doctor for every 1,000 persons, and about one nurse for every 7,000 persons.

With regard to work efficiency, we would make the following observations: Care inside hospitals is unsatisfactory, since the occupation authorities are not interested in the existence of real care as much as they are

interested in pretending that there is care. Half of the jobs have been cut and budgets are very limited. None of the Arab staff know the real amount of the budget or has anything to do with its distribution. Therefore, many patients are forced to buy medicines from outside at their own expense. Medical insurance is exhausting for a public that does not have the material means of continuing it. Medical insurance is based on age and not real income. A family needs more than one medical insurance [policy], which is beyond its means.

The Gaza Strip's hospitals lack many vital specializations and modern diagnostic methods, which requires

them to constantly send patients to Israel, at the expense of the health budget in Gaza. The budget is subject to cuts and auditing. The Israeli official's approval is required in every case, and non-medical considerations often interfere with the process of financing a patient. Hospital equipment is purchased by the occupation authorities and with their knowledge, without real participation by the Palestinian officials, which would make the selection and priorities unsuitable. There is an acute shortage of beds in many sections. The rate of children's bed occupancy, for example, is more than one patient per bed, while in specialized sections such as plastic surgery, urinary diseases, children [as published], and others, there are no more than two or three beds.

Building and equipment maintenance is not available, due to financial and bureaucratic reasons, thereby exposing them to damage. This is due to the authorities' orders to cut expenditures. Repeated army attacks against hospitals and medical units and the arrest of patients have caused the public to lose confidence in the integrity of medical services and force them to resort to other facilities that may not be as efficient.

The occupation authorities have sowed the seeds of dissension among the medical staff and the auxiliary nursing and administrative services, thus dividing the leadership. There is no prudent central leadership to manage the affairs according to work needs. Nursing goes in one direction and doctors go in another. Coordination between the various groups is nonexistent because of deliberate action by the occupation's health authority.

[Boxed item]

UNRWA Bulletin No. 247 of 18 January 1992 spoke about Gaza inhabitants' favorable reaction to the EC decision to contribute to the new Gaza hospital that UNRWA will build.

The bulletin quoted a statement by eight major institutions in Gaza, the text of which follows:

"The national and humanitarian institutions in the Gaza Strip have officially learned that the EC has donated \$16.7 million as a contribution to build a hospital in Gaza under UNRWA administration.

"This contribution will serve all the Gaza Strip's inhabitants. We wish here to express our deep thanks and appreciation to the EC, and hope that positive participation in helping the sons of the Gaza Strip in the fields of social and economic development services will continue. We also hope that UNRWA will begin to implement this vital and important project as soon as possible."

Signatories: The Middle East Council of Churches (Refugee Relief), Palestinian Women's Union, the Central Blood Bank, the Red Crescent Association in Gaza Strip, the Arab Medical Association, the Palestinian Chamber

of Commerce, the Engineers' Association in Gaza, and the Young Men's Christian Association in Gaza.]

**Public health:**

The second part of government health services is that which is responsible for outpatient care and a healthy environment.

There are 27 public clinics that are located in various parts of the Gaza Strip. They are staffed by 68 physicians, eight dentists, and 165 nurses. This is at the rate of 10,000 citizens for every physician and about 5,000 for every nurse. This is half the amount of health services provided for Palestinians inside Israel, in Galilee for example. This is not to compare them with services available to the Jewish population.

Because of severe crowding, a patient does not receive adequate care, since a doctor examines no less than 100 patients daily. These clinics lack diagnostic resources, such as laboratories and equipment. Most of these clinics are clinics only in name, because they consist only of a very limited number of rooms, and the buildings need to be pulled down and rebuilt, not just repaired. Both the public and the workers suffer because of the poor conditions in summer. Many primary care programs are nonexistent. Some examples:

- No school health care, except for some immunization at the beginning of every year;
- No programs or teams for health education or social care;
- No programs for caring for the old and chronically ill people; Medicines for chronic illnesses are subject to unfair health insurance, not to mention sporadic availability of medicines.
- No programs for psychological health or programs concerned with development and growth, and there is no follow-up home care for sick children and elderly people;
- No programs for rehabilitation and nutrition;
- Programs for environmental health are almost nonexistent;
- The unavailability of laboratories for food inspection and no control over food products; The number of health inspectors and workers in this branch is very limited. There are no auxiliary means of transport and equipment for pollution detection.

## BANGLADESH

### Report Assesses Pollution of Waterways

92WN0345A Dhaka THE NEW NATION in English  
28 Jan 92 p 3

[Text] Untreated particulates and liquid and solid wastes discharged into aquatic systems from industrial plants and increased sea traffic are dangerously polluting the country's waters, reports UNB [United News Of Bangladesh].

More than 900 industrial plants, located along major waterways, eject untreated particulates and liquid and solid wastes direct into the aquatic systems, according to official findings.

In the port cities of Chittagong and Mongla, nearly 1,000 ships and 40- 50 oil tankers are handled annually, causing severe pollution of the water in the coastal reaches as well as the marine environment.

The problems have been highlighted in a country report prepared by Bangladesh for United Nations Conference on Environment and Development (UNCED) scheduled for Brazil in June, where heads of state and government of 90 countries are expected to take part to reach an agreement to save the world from environmental pollution. Crude spillage at Chittagong is estimated at 6,000 metric tons per year, while about 24,000 gallons of bilge water is also dumped.

The possibility of accidental oil spillage from oil tankers through which the ecosystems of the Sundarbans could suffer irreversible damage is also there.

The report says the threat of an oil spill to other marine and coastal resources of the delta has not been estimated but can be expected to be severe, even if the spill is small and localized.

Due to draught restrictions in the harbour, large tankers carrying crude or refined products transfer the contents to small tankers, which is also responsible for spillage at the transfer points.

The country report says by the year 2000, water consumption by industry is expected to increase by more than 24 million cubic metre per month.

It identified the leather tanning industry as the most serious sources of water pollution.

Most of the 160 leather factories in the country are situated in the capital's Hazaribag area next to river Buriganga.

Apart from the air pollution, manifested by an obnoxious stench, these industries dump their polluting effluents in the Buriganga river, including an extremely dangerous toxic chemical, hexavalent chromium.

A large surface of polluted water surrounds these tanneries and textile mills, separated from rice paddies by alarmingly low and narrow strips of land.

Chemical industries and distilleries are also major sources of pollutants in local water bodies and rivers. Sulphuric acid plants at Chittagong and Joydevpur emit sulphur dioxide and sulphur trioxide gasses brought back to earth by rain water as diluted sulfuric acid.

No apparent antipollution measures are taken by any of these industries. The Karnaphuly Rayon and Paper Mills are heavily polluting the Karnaphuly river where fish breeding has already been affected severely. Fertilizer

factories in Ashuganj, Fenchuganj and Chittagong also dump untreated effluents into adjacent rivers.

The government has carried out an extensive survey on existing industries and identified about 1,000 of them as polluters.

Pollution by pesticide is increasing and will become a major problem in the next decade if concrete steps are not taken immediately to control its aggravation, the report apprehended.

Upstream use of pesticides and industrial toxic chemicals will have highly cumulative effects downstream, specially in coastal estuaries, it cautioned.

Introduction of antipollution measures in all existing industries is suggested for action needed to combat pollution.

Strengthening of legislative power and the development of institutional capacity to enforce pollution control is crucial, says the report.

To put a stop to further pollution of the water in the coastal reaches and the marine environment, the report suggests that there is a necessity of reception facility for ballast or bilge water from ships at Chittagong or at Mongla to prevent discharges direct into the sea.

### **Official Reports on Progress of Coastal Afforestation Project**

92WN0348A Dhaka *THE NEW NATION* in English  
1 Feb 92 p 2

[Text] The second seven-year coastal and industrial afforestation project of the government involving Taka 111 crore is expected to be completed by next June and officials say this may contribute significantly towards maintaining ecological balance, protection of human lives and above all economic upliftment of the country, reports BSS.

Talking to BSS the Chief Conservator of Forests, MNA Katebi, said a total of 99,905 acres of land was brought under the coastal afforestation project in the districts of Chittagong, Noakhali, Bhola and Patuakhali of which 87,135 acres had so far been afforested.

The industrial afforestation work of 48,780 acres of hilly lands in the three forest regions of Chittagong, Cox's Bazar and Sylhet has also been completed out of the targeted 58,000 acres of land, he said.

The multi-disciplinary project was initiated in 1986 with the economic assistance of the World Bank with a view to keeping the environmental balance, controlling disasters, developing the country's forest resources and stabilising the newly raised coastal lands.

Inspired by the success of the second afforestation project, the World Bank is actively considering to



finance a 280-crore taka third seven- year afforestation project to be started from July this year, official sources said.

According to a Bangladesh Forest Research Institute (BFRI) report, at present the area of forest in the country is about nine lakh hectares.

Environmentalists say the afforestation, especially the coastal afforestation, has a greater importance for disaster management and geo- physical development. The rainwood forest that grow in the tropical areas like Bangladesh help control flooding in many ways. It is found in different studies that in natural rain forests, about 50 percent of rain evaporates back to space, 25 percent is soaked by the soil and the remaining 25 percent runs off. On the other hand, in deforested areas as there is nothing to hold it, only 25 percent evaporates and the other 75 runs off directly striking the land and causing more soil erosion and disastrous flooding according to a SPARSO study. Deforestation in the Himalayan region thus intensifies flood problem in Bangladesh.

The study said deforestation caused wide scale soil erosion particularly in the upper catchment areas of the rivers flowing through Bangladesh. A large portion of these sediments are deposited in Bangladesh delta both inside the country and the coastal areas. Siltation in the riverbeds retards the flow of water down stream and allows more sediments to settle raising riverbeds, flooding which finally results in plains.

The study said forests were also important for controlling atmospheric temperature, one of the major reasons of flood. Green leaves of trees absorb carbon-dioxide, the most heating element, from the atmosphere.

If trees are destroyed, nature loses its most important element to absorb carbon-dioxide thus creating deforestation. The deforestation helps raise temperature, melting snow and causing floods, the study said.

Meanwhile, according to the Bangladesh Forest officials, afforestation has proved to be highly effective in protecting coastal habitations from cyclones and tidal surges in many countries. The cyclonic winds and surges become weaker when these are resisted by the coastal forests.

Afforestation is cheaper and ecologically more beneficial than any other technological measures to protect coastal areas, the officials said.

Another significant advantage of coastal afforestation is stabilising and expanding of newly formed in settled coastal lands. Different studies say over the years millions of hectares of lands in the coast formed but disappeared for want of afforestation.

According to the foresters, present coastal afforestation programmes would help stabilise the two lakh and fifty thousand acres of in settled liquified lands now being emerged along the coastal belts.

Afforestation in Bangladesh is also important for saving the agricultural yields from water carried sediments. Every year a considerable quantity of yields is being destroyed because of sedimentation. As forests protect the soil from erosion, the yields could be saved from the eroded soil, they said.

Although government has imposed a ban on felling of trees from the natural forests, a BFRI report says that an average of 8,000 hectares of forests are being destructed every year. But the proportion between the rate of population growth and industrialisation (the two causes of increasing global temperature) and new afforestation is not compatible, the report said.

Seeing the disastrous impact of deforestation on earth, environmentalists all over the world urge to reduce the 'luxury' of using wood through accepting its different alternatives.

#### North Faces Potential Desertification Threat

92WN0346A Dhaka THE NEW NATION in English  
2 Feb 92 p 12

[Text] Pabna, 1 February—Ferry services on Nagarbari-Aricha and Pakssy-Bheramara routes are threatened as water level has been decreasing rapidly at the river Pudma and Jamuna, reports UNB.

According to official sources, more than 2,000 chars have already surfaced on both the rivers, where dredging work is being hampered by fund shortage.

The allocation of the BIWTA is only Tk. 2 crore per year for dredging, but the amount is said to be too small to complete the work.

The present ferry services in both the rivers are running through one channel which is very narrow and risky. The chars also hamper the movement of ferries, cargoes, launches and other water transports.

According to ferry masters, the movement of the launches becomes difficult as water level is not up to the mark. Six to eight feet water depth is essential for the movement of ferry level. The ferry ghat is required to be shifted to Ranghunathpur, three kilometres south of Nagarbari.

Due to destructive effects of Farakka barrage, about 23 rivers in northern districts have been silted up causing overflow and floods in the rainy season.

Irrigation is being hampered due to fall in the ground water level and farmers have lost hope of this winter crop. About 35,000 fishermen have given up their vocation in the 16 northern districts.

It may be mentioned here that the North Bengal Paksey Paper Mill requires a huge quantity of water every day, which cannot be supplied due to abnormal fall in the water-level.



Knowledgeable sources and experts apprehended that if the water level continues to fall, it might cause extensive desertification of the northern districts.

## EGYPT

### Green Party Elects New Leader

NC1103094992 Cairo AL-AKHBAR in Arabic 4 Mar 92 p 1

[Text] At its meeting the day before yesterday, the Green Party's Higher Committee elected 'Abd-al-Salam Dawud as party leader.

The committee accepted Dr. Hasan Rajab's resignation.

### Expert Explains Egypt's Need for Water Resource Sharing

NC1303184192 Cairo AL-AHRAM in Arabic 11 Mar 92 p 7

[Report by 'Abd-al-Jawad 'Ali]

[Excerpt] Hamdi al-Tahiri, water affairs expert at the Foreign Ministry, has stated that the Arab region's water problem is caused by the fact that 67 percent of its water sources are located outside the region and in non-Arab countries. He said Egypt's share of Nile water is 55 billion cubic meters, which does not meet its agricultural needs. For this reason, Egypt uses part of Sudan's water surplus as a debt. It also uses 5 billion cubic meters of sewage water for vegetable and fruit cultivation, even though in other countries sewage water is not used except for irrigating parks and children are allowed to enter these parks [sentence as published]. Egypt also uses 5 billion cubic meters of underground water and agricultural drainage water [as published]. The rain that falls in Sinai and the northern coast does not exceed 1 billion cubic meters, and as a result of the expansion of desert land cultivation and the increase in the population, the water share for each individual has decreased from 3,600 to 1,110 cubic meters.

Al-Tahiri made this statement at a People's Assembly Foreign Relations Committee meeting yesterday under the chairmanship of Dr. Muhammad 'Abdallah to discuss the Middle East water problem.

Al-Tahiri noted that Egypt is trying to increase its share of Nile River water by using rain which falls at the sources of the Nile and which will run through the Jonglei Canal. Seventy-five percent of this canal has been dug, but work has stopped because of the civil war in southern Sudan. Egypt also is trying to increase its water share through the construction of a dam at Tana Lake [in northwest Ethiopia] to provide 17 billion cubic meters of water. But the Israeli influence in Ethiopia is trying to stir up trouble in order to prevent Egypt from completing its projects in the Upper Nile region and enlarging its water share to meet its increasing needs. With the rain water, Ethiopia can completely dispense

with the Nile water, but Israel has drawn up plans to establish 33 dams along the rivers that run into the Nile in order to reduce Egypt's share of the water. Signs of such plans began to appear this year when Egypt's share dropped by about 1 billion cubic meters because of the projects which Israel is establishing along the branches of the Nile River in Ethiopia.

Al-Tahiri added that Egypt must maintain a position on the dangers that threaten its share of Nile water.

He also noted that Israel is stealing most of the Jordan River water and 75 percent of the underground waters in the occupied Arab territories. [passage omitted]

## IRAN

### Smugglers, Farmers Destroying Nowshahr Juniper Trees

92AS0651X Tehran ABRAR in Persian 27 Jan 92 p 9

[Text] Although the National Forests and Pastures Organization has emphasized the protection and preservation of the juniper trees, this rare type of tree is not being effectively protected.

IRNA reports that this rare type of tree, which grows in dry and unfavorable environmental conditions in rock crevices and alkaline soils in the Alborz mountains between Gorgan in east Mazandaran and Rudbar in southeast Gilan at 511 to 1,000 meters above sea level, is being relentlessly cut as before and shipped elsewhere by wood smugglers, due to the lack of a strong executive law.

Likewise, large portions of the growing areas in this region have been completely destroyed and converted to orchards and private land by profiteers and rural people.

In the area between the regions of Kani and Delam alone to the south of Chalus, considered one of the most vulnerable juniper growing areas, of the 4,007 hectares of juniper lands, more than 1,280 hectares have been completely destroyed through gradual cutting and conversion to pastures and fruit orchards.

In recent years the juniper growing areas, considered among the nation's natural wonders, have been declared as national parks by those responsible for preserving forests, the rural people in neighboring areas have played a major role in reducing the numbers of this rare type of tree, seeking to use juniper wood for making inlaid crafts, spindles, spinning implements, and for other traditional uses.

Likewise juniper wood, because it is easy to work with, strong, impervious to moisture and gives off an odor that repels moths and other vermin that attack wool, is especially favored for building clothing chests and trunks.

Currently on the smuggled wood market a cubic meter of juniper wood is sold for more than 800,000 rials.

Experts of the National Forests and Pastures Organization say that the growth of juniper trees is connected to the geological age, but if the destruction of this band of growing areas continues, in the next 50 years there will be no remaining trace of this unique community of juniper trees.

According to history, the Semiramis Bridge over the Euphrates River was built by Alexander the Great using durable Juniper wood, and in the distant past Iranian, Greek, Egyptian artists, and residents of the Island of Crete used juniper wood to build vessels, lutes and other musical implements and tools.

More than 1.053 billion rials credit has been allocated this year by the National Forests and Pastures Organization to carry out emergency projects to preserve the nation's forests. Yet according to those in charge of preserving the forests, more than \$100 million is spent annually to buy wood and other raw materials needed by the nation's wood industries from other countries.

## IRAQ

### 'Greens Party' Established

JN1803095392 Baghdad INA in Arabic 0820 GMT  
18 Mar 92

[Excerpts] Baghdad, 18 Mar (INA)—Under the umbrella of party pluralism in Iraq, the establishment of a new political party under the name "Iraqi Greens Party" was announced here today.

Mazhar 'Arif, leader of the emergent party, told BABIL today that preparations are under way so that the party can exercise all activities on the national, Arab, and international levels.

The Revolution Command Council, the highest legislative authority in the country, issued the Political Parties Law last September to deepen and bolster the foundations of democratic practice in line with political, economic, and social developments in the country. [passage omitted]

Mazhar 'Arif noted that his party will take care of environmental issues in Iraq and the Arab homeland in compliance with the Stockholm Declaration on environment for 1972 and all principles for protecting and improving the environment on the Arab and international levels, in cooperation with all nations. [passage omitted]

Mazhar 'Arif, a journalist and writer on political affairs in the Iraqi press, said his party will ask the international community to respect the rights of the Iraqi and Arab people, since the party is responsible for protecting the Arab environment for the sake of future generations. The party will also seek to develop a legal framework for the protection of the environment and will give precedence to environmental plans that have an immediate impact on development. [passage omitted]

Mazhar 'Arif noted that his party includes a number of educated people, politicians, and specialists. [passage omitted]

## SAUDI ARABIA

### Jiddah Desalination Plant To Increase Output

92WN0322A London AL-SHARQ AL-AWSAT  
in Arabic 15 Feb 92 p 10

[Unattributed report: "New Desalination Plant in Jiddah To Begin Operation in Two Years"]

[Text] The director general of water projects in Jiddah, Eng. Muhammad 'Ali al-Fa'r, expects the rate of pumping fresh, potable water in Jiddah in the next two years to increase to 415,000 cubic meters [m<sup>3</sup>] per day upon completion of the new desalination plant, which operates on reverse osmosis and puts out 15 millions gallons a day. Jiddah used to receive about 390,000 m<sup>3</sup> of fresh water daily. Al-Fa'r pointed out that 90 percent of Jiddah's water comes from the huge desalination plants along the Red Sea, while the remaining 10 percent comes from Wadi Khulays [Wadi 'Arran] and Wadi Fatimah near Makkah. He explained that the amount of water coming from Wadi Fatimah, which is used by the residents of al-Jumum and Jiddah suburbs as far as Kilometer 14, has increased from 4,000 to 8,000 m<sup>3</sup>, while Wadi Khalis water has gone up from 15,000 to 25,000 m<sup>3</sup>.

He said that the Umm al-Dar and the Khalis springs, which had been idle for 15 years, have resumed pumping, thanks to the heavy rains that fell on the kingdom recently and the rise of the groundwater level, which used to be 11 meters underground, but is now only one meter. He mentioned that six new 50,000-m<sup>3</sup> standby reservoirs are under construction which, added to the 14 existing reservoirs, will provide up to 580,000 m<sup>3</sup>. He said that the Jiddah water network presently covers about 80 percent of the expanded city, and the remaining amount will be covered when the projects east of the expressway, which are ready for implementation, are completed.

### Government Water Resource Achievements Reported

92WN0322B Riyadh AL-RIYAD in Arabic 19 Feb 92  
p 2

[Article by Amal Husayn: "Kingdom Is First in Desalinated Water Production"]

[Text] Water is the most important and fundamental element in human life, and making it available is the most important element for successful economic, agricultural, industrial, and other growth.

Water takes on added importance in a vast country like the Saudi kingdom because, due to its shortage and

scarcity, it is one of the greatest challenges facing development in Saudi Arabia. Whereas we are aware that water is the mainstay of life, it behooves us to be aware of the difficulties and obstacles that the Saudi population has encountered in the past. Wells were the only source of desalinated or ordinary water for consumers through water carriers, and then through pick-up trucks.

The occurrence of stifling crises, especially in summer, have become expected and common, keeping the important issue of water in the forefront of challenges facing the country's development surge. Development, however, with all its ardor and energies, has been able to overcome this problem facing it.

### First Steps

Perhaps the first developmental step to settle this problem began in 1352 Hijrah [1934-1935], when the kingdom drilled the first deep well, which was followed by other wells, thus decreasing the water problems with the utilization of groundwater resources. The second step came in 1373 Hijrah [1954] with the establishment of the Ministry of Agriculture and Water to guarantee the best local development and the best utilization of resources. Jiddah, however, followed a different course for water acquisition, represented in the Khulays fresh-water project. This beginning in 1387 Hijrah [1967-1968] was the nucleus for the gigantic desalination plants and projects that now cover the greatest part of the kingdom.

The desalination process and plants are but sophisticated examples of the interest the government is according everything that has to do with the people's interest and benefit. Providing water is considered a vital requirement that the government has fulfilled through various channels and ways and means by dedicating huge efforts and capabilities. These efforts are clearly visible in the large quantities of water that the desalination plants have been able to provide.

Desalination nowadays has become a developmental aspect related to the citizenry and other developmental activities. Therefore, the establishment of the General Establishment for Water Desalination was an expression of the government's concern with the water issue. The government created this special authority to undertake this task, using available technologies with great efficiency to supply water to most regions, be they close to or far from the sea. Thus, development may face this difficult challenge, without regard to water meters and obstacles, to make water abundantly available at low prices for everyone.

### Water in the Service of Development

The government has been able to provide water for drinking, agriculture, industry, and all other facets of development via an integrated strategy, thus achieving the desired objectives.

Groundwater in the kingdom is a major source of drinking and irrigation water, and in light of that, the Ministry of Agriculture and Water has given its attention to drilling wells. In 1408 Hijrah [1987-1988], the ministry drilled 4,667 wells, including piped and manual drinking wells, and monitoring and experimental wells for agriculture.

As for residential wells, in 1407 Hijrah [1986-1987], they amounted to 44,000, and the ministry implemented a number of integrated water projects, each serving a number of cities and villages in the kingdom. The most important of these projects are the Riyadh water project and the Jiddah water project, each including a number of groundwater sources, pumping units, high-capacity reservoirs, huge pipeline systems, and local distribution networks. On the other hand, in order to develop and conserve water resources and safeguard them against floods, the ministry, as of the end of 1408 Hijrah, built 180 dams of various kinds and sizes.

It also built 47 dams and dikes throughout the country, with a view to increasing the pastureland, raising the land's water content, and raising the production efficiency of natural pastures.

### Desalination Plants

As part of the growth and development services that the government is seeking to offer under the leadership of the Custodian of the Two Holy Mosques in order to provide a happy life to the people, it created the General Establishment for Water Desalination, which is playing a major part in this gigantic civilizational boom. This establishment has left clear prints on the civilizational building of the Saudi citizen, for in a very short time, it has been able to realize its assigned objective. In this regard, it has constructed 29 desalination plants of various sizes and in different locations based on an order of priority. Moreover, future plans aim to provide fresh water to every city, village, and agricultural settlement throughout our beloved country.

The establishment has enjoyed generous government support. Appropriations of up to 740 million Saudi riyals were allocated for it for the operation and maintenance of desalination plants in 1990. The latest budget was 1.712 billion riyals. Its responsibility has not been confined to managing and operating these vital utilities, for it has contributed to preparing studies, plans, and programs for the construction of new desalination plants, water reservoirs, and residential centers; the delineating water pipelines and preparing an economic feasibility study for proposed projects, soliciting the help of the best advisors in this field.

### Kingdom and Distilled Water

The kingdom has been able to grapple with the water shortage in a pioneering fashion. In the last few years, the kingdom has implemented several integrated projects to provide abundant sources of water. During the fourth

five-year plan, for 1405-1410 [1984-1989], the government allocated 396.2 million riyals for distillation projects.

Its vast land makes it the 12th largest country in the world in terms of area, hence the additional problems it has had to face in overcoming the matter of providing water for the populace scattered over a vast area of 2 million [word missing] of land. However, through ambitious plans in this domain, it has been able to surmount these problems by building huge pipelines to carry water from water-distillation and treatment plants to residential centers. The line that carries water from desalination plants in al-Jubayl to Riyadh is the most famous pipeline.

Saudi distillation plants have a high-output capacity estimated in 1985 at 500 gallons per day. This output capacity is higher than that of all the countries of the world put together. Moreover, there are new plans to raise the output capacity of water plants.

Saudi Arabia is a world pioneer in the desalination of seawater, for its overall output constitutes 30 percent of world output. This has allowed it to be an important source of information and expertise for many advanced industrial countries. The overall output of the General Establishment for Water Desalination, upon completion of the current projects, is estimated at 600 million gallons per day. The total length of the pipeline extending from the plants to the benefitting areas is over 3,700 km.

The amount spent on establishment projects from the time it was founded until the end of the fourth 5-year plan is more than 55 billion riyals, a clear and unqualified indication of the government's concern with meeting the kingdom's growing fresh-water needs.

In addition to its 70 percent of fresh water output, the kingdom also provides 20 percent of electricity.

#### **Saudi Human Resources**

Regarding the training of national cadres to work at this establishment, several training centers have been set up in al-Jubayl. These centers enjoy a very high standard of training staff or necessary equipment and devices. This is truly a unique and specialized academy, on both the regional and world levels. There are also small training centers at every plant to provide periodic training for plant employees. This is in addition to the training such employees receive at certain institutes and colleges to acquire required experience in this field.

Moreover, the establishment holds membership in related world organizations for the purpose of keeping up with the latest scientific inventions in the water-desalination field.

The establishment and its branches employ over 50 percent of Saudi engineers, technicians, and other workers, and the reverse osmosis plant in Jiddah along the western coast is the largest of its kind in the whole world.

The reverse osmosis technique used at the al-Jubayl plant is a modern water-desalination method that is not widely used in the world and is noted for its low costs.

The kingdom has been able to dedicate its financial capabilities to development and growth. Water is now easily available amid varied and rough geographic conditions and topography, so that development may once again demonstrate its ability to dedicate all energies to the service of the country.

# **Yablokov Assesses Ecological Prospects for CIS, Russia**

92WN0362A Moscow MOSKOVSKIY  
KOMSOMOLETS in Russian 5 Feb 92 p 2

[Interview with Aleksey Vladimirovich Yablokov, state counselor for ecology and public health, chairman of the Coordination Council for Ecological Policy under the president of the Russian Federation, by Nadezhda Yavdolyuk: "The Stalker"; date and place not given]

[Text] The first office in which we met for a discussion with Aleksey Vladimirovich Yablokov in the Institute of Biology of Development imeni Bakh in 1987 was rather dusty and crammed full with books.

The second—on Kalininskiy [prospekt], where the Committee for Ecology of the USSR Supreme Soviet was located, had carpets on the floor, and the airspace was intersected by a garland of postcards from all countries and peoples.

The third—in the White House, a miniature conference hall, austere and cold. The only detail that made it similar to the other offices of Yablokov are the immaculately sharpened colored pencils in a little glass.

On Wednesday, 22 January, the state counselor for ecology and public health and chairman of the Coordination Council for Ecological Policy under the president of the Russian Federation moved the next time.

This time into the Kremlin. . . .

[Yavdolyuk] The impression has taken shape that in the formation of the CIS [Commonwealth of Independent States] many ecological problems have fallen by the wayside. The Aral Sea, for example, can indeed be called somebody else's. Or is this quite an extreme view?

[Yablokov] This view is not simply extreme, it is also a quite incorrect view. Already in the Minsk Protocols it is written that the member countries of the Commonwealth will include an agreement on the Aral problem. What is more, on our own initiative, we are preparing our variant of an agreement for the conservation of the fish and other resources of the Caspian Sea. The meetings of the heads of government took place on 30 December, and the draft was ready already on 11 January. Now, together with the minister for ecology and natural resources, we are trying to see to it that by the next session a large agreement on cooperation of the member states of the Commonwealth in the sphere of ecological safety. Now the problems of territories and the army command a great deal of attention, but, no matter how strange, the disintegration of the Soviet Union made it possible to activate the ecological work.

[Yavdolyuk] Thus, now the solution of ecological problems on the highest state level will become the rule?

[Yablokov] And it is impossible otherwise. Moreover, there are interesting dreams. We would like to follow the

example of the Western countries. They have a project of "ecological bricks"—to make all borders in the common European home into natural parks or preserves. Examples: Belorussia and Poland jointly administer the Belovezhskaya pushcha preserve. Ukraine, together with Hungary and Czechoslovakia, intend to establish a preserve in the Carpathians. We are working on such a preserve with Finland, and discussions are being held on a project of creating, jointly with the United States, of a national park in the Bering Sea.

[Yavdolyuk] To be honest, I don't quite understand: A national park—in the sea, how is that?

[Yablokov] What is a national park? It is not a preserve, where no economic activity of any kind is possible! A preserve is a territory that is being fully preserved. This is being done in order to preserve nature for future generations. A national park has a different task. In the first place—the organization of recreation for the population. The Bering Sea is a historically astonishing place. Through the Bering Straits America was settled 20,000 to 30,000 years ago. The culture of the American Indians is very close to the culture of the inhabitants of Northern Asia. Almost identical forms of clothing and custom. People travel there to look. Moreover, in the Bering Sea there are unique places, where grey whales fatten themselves, which multiply in the waters of Mexico and America. Observations of these whales can be organized. The breeding-grounds of sea animals are there. In my time, when I studied sea mammals, I spent a whole week at the shore. When a thousand walrus come out on the shore—it is an indescribable sight!

[Yavdolyuk] Don't you get bored on such trips?

[Yablokov] Of course. But in 1989 I made a choice. At that time, understanding the desperate ecological situation of the country, I decided that my experience and knowledge would be more effectively utilized in the organs of state administration in order to improve the ecological situation as a whole. Up to now I have not become dissuaded.

[Yavdolyuk] It seems to me that the misfortune of people who go into politics is that they end up being distant from reality. They are so captured by the scale of state problems that. . . .

[Yablokov] Why? No. I was just now on a trip with Boris Nikolayevich in Bryansk Oblast, which suffered most of all after the accident at the Chernobyl Atomic Power Station. This is such a misfortune. . . . It can hardly be compared with anything in the history of contemporary humanity. . . . There exists a conception of safe living. This is the well-known decision on the zones from 1 to 5, from 5 to 15, and from 15 to 40 curies. Resettlement has begun, but according to the last data it has turned out that the decision of the Supreme Soviet of Russia and the former Union requires changes. On the basis of the analysis of the radiation damage, we thought that the pollution was uniform. What were these data based on? A helicopter flew by with a counter, which took the



average indicator for every 250 meters, averaging the data for the whole territory. It turned out that the pollution was incredibly spotty. Perhaps, an area the size of a desk with very high radioactivity, and then 200-300 meters of clean soil. It is clear that, if this spot is decontaminated, a whole village can exist.

Now it is necessary to approach on an individual basis also the treatment of every person. Safety cannot be assessed only in terms of some minimum dose. Change in the structure of the enamel on teeth, the restructuring of chromosomes, these analyses, though difficult, can be carried out everywhere, allowing the determination of the radiation damage of anyone.

**—Up to 35 percent of the population in industrial regions suffer from immunodeficiency, and up to 20 percent of the population suffer from allergy.**

Here I, for example, received 40 rems. This is higher than the norm. Where could I have collected so much? I was not in the Chernobyl zone before January 1992. I worked as a zoologist in Kazakhstan. And now that the data on the influence of the Semipalatinsk Testing Range have been revealed, it is clear where. Several times I visited one of the most polluted sectors—the settlement of Yegindyoulak and surroundings. We caught lizards there. I had no relations to military tests, I worked as a population biologist. I was in Mangyshlak a number of times. There, too, a series of underground nuclear explosions were conducted. The territories are not enclosed, there are no warning signs. Altogether, about 130 underground nuclear explosions were conducted in the former Soviet Union. In the Volga basin alone—26. In the Volga basin! What monstrous ecological loads these are! I wanted to know, is this as safe as the military say, who conducted these explosions for peaceful purposes. I traveled over five such places in Yakutia. In two cases, there was strong radioactive pollution, similar to that in Chernobyl. Perhaps not of such a scale, but in terms of consequences. . . . In Chernobyl there stands a red-brown forest and in Yakutia—red-brown. The leaves have fallen, the branches have crumbled. I have photographs! And this is where theoretically there should not be anything. No radiation of any kind. All of it should have remained there, in the depths, under a layer of permafrost.

**—The water from 75 percent of the rivers, lakes, and other reservoirs is unfit for drinking.**

In the Vilyuy River valley, where the majority of these explosions were conducted, children with leukemia turned up. Cancer of the blood had previously never been encountered here. Of course, now it is difficult to establish, let us say, for a court that the cases of these illnesses are connected with the tests in the 1980's. But all our experience indicates that this is precisely the case.

So that I am not remote from reality, I travel through the country. My task is to stimulate the adoption of state decisions on the basis of the results of these trips. It is

clear that radiation pollution is the most terrible in Russia. The Chernobyl zone now encompasses 16 oblasts.

[Yavdolyuk] It what—is becoming unravelled?

[Yablokov] No. We are obtaining new data. In December the State Commission added five more regions damaged by Chernobyl precipitation. Among them: Mordovia, Penza, Samara, and Saratov oblasts. But there is still greater radiation pollution in the Southern Urals.

But let us take the Kola Peninsula, where there are quite a few written-off submarines and piles of radioactive waste. And it is not known where to put them, and how to store them, these finished nuclear reactors and spent fuel.

In the Far East—the same problems. And the plants that produce nuclear weapons? Tomsk, Krasnoyarsk, Arzamas. For decades no one called attention to this. We have encountered these problems only now.

[Yavdolyuk] How does Russia conduct itself in its relations with respect to the other states of the Commonwealth in regard to the difficult ecological problems? For example, the burial of radioactive waste? Not long ago, Krasnoyarsk refused to accept the "presents" from the Ukraine, and similar situations, probably, will be repeated?

[Yablokov] I hope, Russia will conduct itself in a civilized manner. In the world all these questions have been solved. Not storage and transportation, but cooperation and trade. Everything can be done on an economic and political basis. If a nuclear waste storage dump exists in Krasnoyarsk, the risk for the population of the city is significantly greater than in other places. And for this risk the population has the right to receive money. It is necessary to pay additional money to people who are living next to a nuclear power station. This is how it is done throughout the world.

[Yavdolyuk] Which of the ecological problems would you single out as the most serious today?

[Yablokov] Two. The unravelling of the ecological disaster zones and the destructive use of natural resources. Now, after the adoption of a law on the protection of the environment, we have justifications for the official singling out of ecological disaster zones—these are those regions where there is a reduction in the length of life, there is an increase in the prevalence of disease and in infant mortality. And, unfortunately, there are more and more of such territories. In some regions of Russia, people do not live to retirement. For example, in the city of Nikel the average length of life is 44 years. Who there needs freedom of speech, the freedom of street processions and demonstrations if everything is finished already at 40?

In our country, 30 percent of the people die in their working age. What is that good for?

To the announced ecological disaster zones, i. e., Chernobyl and the Southern Urals, will soon be added several regions of the Kuzbas, some parts of the Lower and Middle Volga, and some regions of the Amur Area—there the forests have been exterminated, the waters have been defiled, and the Lower Urals—the places of the oil processing industry, Ufa, Salavat.

The second misfortune, connected directly with the transition to market management of the economy, is the more intensive exploitation of natural resources. The danger of the reduction of forests, the rapacious use of mineral resources. Thus, in general, it has always been: When one economic system was changed by another, nature suffered most of all. People tried to obtain profit as quickly as possible through hunting, fishing, and forest cutting.

[Yavdolyuk] But to whom will the mineral resources belong?

[Yablokov] This question is being raised especially pointedly by the republics that make up Russia. They want for the resources to be fully their property. On the one hand, the requirements are just and correct. On the other hand, . . . There is, for example, the Astrakhan gas condensate deposit, where oil and gas are found at an enormous depth, under enormous pressure, and at a high temperature. If Kazakhstan and Russia will start to exploit it simultaneously without having coordinated their actions, they will deprive each other of a large share of the wealth, instead of 100 percent they will receive 20 to 30 percent each, all the rest will remain in the earth. And even this you will never attain.

There must be a unified strategy for the utilization of mineral resources. Especially in Russia. We are not talking about sand and clay. But, for example, about coal, diamonds, and ores. Mineral resources cannot belong to some rayon or oblast. Only the state as a whole has this right. It will be able to dispose of them correctly. One would think, why talk about the forest. That's right, the forest is not only timber. It has enormous significance for the protection of nature. What the weather will be like depends not on the government, but on the forest.

—Every year up to 700 large explosions of oil and gas pipelines occur in the country. In so doing, from seven to 20 percent of all the oil being extracted—tens of millions of tons—are lost.

[Yavdolyuk] And if the independent states start to sell their resources or the right to dispose of them to foreign states and companies? Not to Russia. To others.

[Yablokov] As an ecologist, I can say very little here. This is a political matter. For a very long time, we have lived at the expense of oil. There exists the justified opinion that, if we not had had oil and gas, we would have made the transition to a normal economy 30 years ago. These \$500 billion or \$600 billion made it possible for that idiotic system under which we lived to exist. More than half of the entire national economy worked

for defense! Why do we have 30,000 nuclear warheads? Why do we have tens of thousands of tanks? We have created an enormous militarized state at the expense of oil and gas. I repeat, to sell or not to sell—this is a political question.

Something else must be understood: The day may come when there will be nothing to sell. Are we able to make correct use of secondary resources? In Japan, and what is more in other developed countries, they are used to the extent of 30-40, sometimes 60 percent. And we—a maximum of three percent.

[Yavdolyuk] What do you think our country will be like in five years or so?

—According to prognoses, in 20 years more than half of the territory of Moscow will be dangerously heated.

[Yablokov] I think that we will halt the degradation of the natural environment. From a political standpoint, I think, that Russia will have another administrative structure. There will be the lands: Western Siberia, Southern Urals, Yakutia, and Bashkiria. Previously, all administration came from the Center. It is clear that it will not be so any longer. All vitally important questions will be solved at the local level. I will not be opposed if a Far Eastern Republic will come into being within Russia. This will make it possible to improve the living conditions and the use of natural resources. An owner will not allow the felling of thousands of square kilometers of forests and their transformation into a desert.

[Yavdolyuk] Do you believe that, given the economic crisis, the solutions of any ecological problems are possible?

[Yablokov] They are possible. No one will ever solve all the problems. Even the Western countries have not solved all the problems. This is the dialectic. They have found a way out to improve the quality of drinking water—they do not know how to overcome noise and how to preserve the ozone layer. At the expense of what means do we intend to solve these tasks? At the expense of paying for the use of natural resources. The more you pollute, the more you pay. The day is coming when the enterprise is brought to ruin. It has nothing to exist on, all its funds have been eaten up by penalties. All the Western countries have managed to get out of the ecological pit following this path. I hope that the activeness of the population in defense of its rights will help us. Last year there were about 150 lawsuits in America by citizens against enterprises due to whose fault they lost their health. The compensation of damages is calculated not in the dozens or thousands, but in the millions of dollars. The lawsuits were satisfied partially, but this was sufficient for all enterprises to be afraid of poisoning their citizens.

—In the chemical industry, the wear and tear of the fixed production assets amounts to 75-80 percent, which increases the probability of the occurrence of catastrophes.

[Yavdolyuk] Last spring in Moscow, at one of the closed plants in Krasnogvardeyskiy Rayon, more than 200 people suffered as the result of an accident. People living in the neighborhood sought help in the polyclinic with signs of poisoning. Some of them were hospitalized. Moreover, no one knew how to treat these victims, because the origin of the illness was unknown. People's deputies could not bring the investigation to the end—they were simply not given the information.

[Yablokov] Such a case now may be the subject for a court examination. If, on the one hand, there will be laws and an economic whip, and, on the other, the activeness of people, and all feel that the right to a safe ecological environment is defended by the court, the situation will be changed.

[Yavdolyuk] Aleksey Vladimirovich, under what conditions will you abandon political activity? When will you consider this possible?

[Yablokov] For me this question is always urgent. As long as I feel that I can influence state administration, I will be here. As soon as I come to realize that my presence as a member of the administration of the President of Russia is senseless, I will leave immediately.

P.S.

[Yavdolyuk] "What do you dislike most of all," I asked when we parted.

[Yablokov] I? I dislike unfreedom most of all. Internal chains. I did not force myself to talk. It would be difficult for me to be silent.

#### **Number of Independent Ecological Organizations Increasing**

92WN0312A Moscow *EKOLOGICHESKAYA GAZETA* in Russian No 11-12, 1991 p 2

[Article by S. Zhukov based on Ekoinform Agency materials: "Funds, Associations, Alliances"]

[Text] Perestroyka has provided the impetus for the unprecedented in scale development of the independent ecological movement.

The last two years have been marked by the energetic work of such organizations as the Ecological Society, the Noosphere Research Center, the Alliance of Chernobyl Veterans, the all-Union public organization called the Green Movement, the Center for Ecological Research of the USSR AS (Academy of Sciences) Institute of Geography, the Commission for Socio-Ecological Initiatives of the USSR AS, the Interrepublic Committee to Save the Dniepr, the EKOS Ecological Alliance of Associations and Enterprises, the EKOL Association of Mass Information and Communication Media Workers for Ecology and the Soviet Association of Parks. Other

organizations which have also emerged are the Ecological Action Fund, the international organization CHERNOBYL-AID and the Moscow EKOPROM Ecological Consortium.

Despite numerous difficulties, organizations created during the years 1985-1988 are continuing their work: the Ecology and Peace Association, the Ecology Fund of the USSR, the All-Union Independent Comprehensive Ecological Expedition of YUNOST Magazine, the Center for the Development of Ecological Equipment, the Actions in Defense of the Biosphere Association, the Association for the Development of Wind Power, the World of the Oceans Committee and the Bambi children's ecological movement.

Operations have also been started by more recently established organizations: the Committee for Global Ecology of the U.S. National Academy of Sciences and the USSR AS, the Moscow International Power Engineering Club, the Forum of Scientists and Specialists for Soviet-American Dialog, the International Fund for the Survival and Development of Humanity and the Soros Cultural Initiative Fund. In the fall of 1990 three divisions of the worldwide ecological organization Greenpeace began operating in the USSR.

At present the process of forming ecological alliances at the regional level can be observed ever more clearly. We shall limit ourselves to mentioning only a few of those which are more or less stable: the association Ecology of the North (Arkhangelsk, Severodvinsk), the Green World Ecological Club (Kazan), the Women of Nizhny Novgorod Against GAST [expansion not given] Committee, the Ecological Association youth center (Chelyabinsk), the Ozone Ecological Club (Sverdlovsk), Ecological Initiative (Novosibirsk), the Ecology and Man Association (Norilsk) and the Noosphere Club (Kemerovo).

Regional centers of the ecological movement are being established in regions affected by the Chernobyl disaster and the results of nuclear weapons testing. They include the Ecological Movement (Bryansk), the Ecological Alliance, the Youth Ecological Movement (Belorussia), and the Nevada-Semipalatinsk Movement.

The emergence of numerous public funds (in late 1988 and early 1990) took the form of a brief splash caused by the suddenly-available opportunity to escape from the bans and limitations imposed by the unified banking system of the USSR. The ecological movement began to establish banks and funds, a typical example of the propagation of new structures operating according to their own laws and often possessing an antiecological orientation. Moreover, in a majority of cases the actual ecological work remains unrealized.

As of today what are the most common features in the development of the ecological movement in the USSR?

These are above all:

- 1) the growth of independent ecological organizations throughout the country;
- 2) significant expansion in the social base of ecological organizations and movements;
- 3) serious financial difficulties, which are being experienced by a majority of the recently-created organizations;
- 4) diversity among the independent ecological organizations, of which there are now more than 200 varieties; the desire of certain movements to acquire Green Party status; the amalgamation of small organizations and the formation of larger structures.

### Official Disregard of Scientists' Environmental Efforts Decried

92WN0312C Moscow *EKOLOGICHESKAYA GAZETA* in Russian No 11-12, 1991 p 3

[Article by A. Kashtanov, chairman of the Central Council presidium of the All-Russian Society for the Protection of Nature, academician and vice-president of the All-Union Academy of Agriculture imeni V.I. Lenin: "Halt the Global Catastrophe"]

[Text] In the last year and a half, as a result of the political battles and the economic crisis which has engulfed the country, the daily concerns about essentials such as food have pushed ecological problems somewhat into the background. This lull, during which people have become used to ecological stresses and catastrophes, is very disturbing.

The fact is that the ecological situation in the country is growing worse daily; a slow but steady slide toward a global ecological catastrophe is taking place. Facts? By all means.

The spot checks conducted by our community have shown that unique natural landscapes continue to be destroyed, and with them small rivers, lakes and oak forests are disappearing from the face of the earth. The Siberian taiga and tundra, not to mention the dying black-earth lands, are threatened. Discharges of heavy metals have not yet been reduced, especially in the major industrial centers. The Chernobyl wound is bleeding. One can cite a hundred such examples.

All this provides evidence that our society has become blind and deaf to its own ecological problems, as paradoxical as that may seem.

The country has adopted legislative and other kinds of documents on ecology. But the problem is that they are not being carried out. The broken economic ties between agencies and enterprises have weakened still further the material-technical basis of ecology. Enterprise collectives are now worrying more about economic survival than about protecting the environment. As one director said to me recently: "We are not up to treatment

facilities, we are not up to ecology." A dangerous position! The ecological crisis is no less terrible than the economic one, and together they can destroy the foundations of a society's ability to sustain itself. They may give rise to a desert, something which has already taken place in the Aral area and a number of other places.

Despite the fact that the state and political organs, busy as they are with internecine war, are little interested in science (they curse it more than they use it), it (science) nonetheless is making a useful contribution to the resolution of ecological problems. For example, the collective of the All-Union Scientific Research Institute of Agricultural Radiology (the director is VASKHNIL Academician R. Aleksakhin) is working on methods for improving the ecological situation in regions exposed to radioactive contamination resulting from the Chernobyl AES [nuclear electric power station] disaster. Recently Obninsk was the site of a representative conference of scientists at which the results of research carried out over five years were examined in detail and tasks in the further development of science were set out.

Two years ago scientific-coordinating councils were established under the VASKHNIL [All-Union Academy of Agriculture imeni V.I. Lenin] presidium, and they are now actively working on problems of the Aral and the Caspian Sea areas. The research programs for the coming years call for the formulation of regional agriculture systems which would insure maximal consideration for the local ecological conditions of kolkhozes, sovkhoses, peasant farms and other enterprises of the agro-industrial complex.

The shift to agro-topographical systems of agriculture creates conditions for the optimal, ecologically and economically substantiated utilization of natural and economic resources, for the application of environmentally-conserving and energy-saving technologies, and for the production of high, stable yields and ecologically pure agricultural output.

The state scientific and technical program entitled: "Highly Effective Processes of Food Production" is being carried out; it stipulates the formulation of alternative systems for the conduct of agriculture; as well as ecologically safe, energy- and resource-conserving technologies in plant cultivation, animal husbandry and the processing industry; these are to be the basis for obtaining ecologically pure output.

As a result of the worsening soil pollution, and the increasing difficulties of preserving and increasing soil fertility, a special program entitled "Soil Fertility" is being carried out; about 20 million rubles have been allotted for it.

Soil fertility is an integral indicator which reflects natural, historic and socioeconomic conditions, as well as the level of scientific-technical progress and general culture of the society. With the transition to a multistructured economic system and market relations, the role of soil fertility as an economic and ecological factor



increases sharply because the results of economic activity by all land users and the state of the environment depend on it above all.

As a result, the USSR State Committee on Science and Technology has given a high priority to the task of formulating methods and technologies for developing highly-productive soils (agricultural lands), taking into account the bioclimatic potential and existing resources.

In this program research was started for the first time on monitoring the soil cover (VASKHNIL Academician N. Milashchenko is the scientific director). It is important that those participating in this work include not only scientists with terrestrial skills but also those familiar with methods of monitoring the environment from outer space.

Detailed studies on the programming of soil fertility and yields with a strict ecological basis are being carried out under the scientific leadership of VASKHNIL Academician I. Shatilov.

Scientists specializing in land reclamation have begun research on the formulation of new, ecologically safe, water-conserving technologies and systems for land improvement (VASKHNIL Academician B. Shumakov is the director).

For the first time in our country's history, plant breeders and specialists in agricultural radiology have begun work on evaluating and creating varieties of food (wheat, barley, oats) and fodder crops, which are resistant to radionuclides, as well as plants with meliorative properties which are capable of growing in salt and acid soils, of which our country has about 200 million hectares (Academician V. Shevelukh is the scientific director).

As we see, scientists are working actively for today and tomorrow. It is a pity that contemporary politicians and state officials are not interested in these studies, which are important for the country. And they are necessary; after all, without science, no country has a future. Incidentally, scientists and practitioners in the United States, England, Canada, France and other countries are displaying great interest in these projects. We have developed good ties here.

The next congress of the ARSPN [All-Russian Society for the Protection of Nature] is scheduled for October of the current year. The ARSPN has its own organizations in every republic, kray, oblast, rayon and at enterprises; their members are carrying out a great deal of selfless, creative work at the local level to protect and restore natural resources. They are self-sacrificing people who do not demand any remuneration for their noble labor; they are people who are giving of their strength, knowledge and free time to save the environment. They are the ones who have conducted dozens of spot-checks and prepared proposals for government organs at the local and republic levels on saving small rivers, forests, wildlife sanctuaries and natural landscapes from barbaric destruction, pollution and other tragedies.

But many local councils, to our great regret, do not heed our opinions. And people are also deaf to them at the higher levels—in the RSFSR Ministry of the Agricultural Industry, the RSFSR Council of ministers and the RSFSR Supreme Soviet, to which the presidium of the ARSPN Central Council has appealed more than once.

This deafness is incomprehensible to our members. Have political passions truly pushed into the background the most important thing, which is concern for our common home, the home in which we were born and now live? After all, our previous bitter experience testifies that there cannot be a correct, humane and promising policy, no matter with whom it originates, if it does not encompass ecological problems, including the protection of nature and the environment.

### Minister Shubin on State of Russia's Forests

92WN0313A Moscow *EKOLOGICHESKAYA GAZETA* in Russian No 11-12, 1991 p 6

[Interview with Valeriy Aleksandrovich Shubin, RSFSR Minister of Forestry, by Konstantin Klimenko, editor-in-chief of *EKOLOGICHESKAYA GAZETA*, date and place not specified]

[Text] [Klimenko] Valeriy Aleksandrovich! We all learned in childhood the trite phrase "the forest is our green friend." But what is our attitude toward the forest? I have in mind, of course, the state's approach.

[Shubin] The approach is still wasteful. Every year 1.6-1.8 million hectares of forest in the republic are clear cut. More than 5 billion rubles [R] are spent on cutting and removing trees, while only R77 million are spent on restoring the forest.

But the problem is not just the excessive cutting. It is also painful to see how stupidly the wood is being used. Every year 360 million cubic meters of felled timber are procured and yet there is still a shortage of wood products. At the same time about 40 percent of the timber procured ends up as waste in various forms. Great losses occur when timber is being floated or otherwise transported. Frequently the timber is sold abroad for unjustifiably low prices.

[Klimenko] I am afraid that readers may get the idea that it is all up to the minister, who knows all the problems of forest management. Use your authority, save the forest, manage it carefully. But does the forest have a single owner? There are quite a few organizations which have the word "forest" in their names: Ministry of Forestry, State Committee on Forestry, the Russian Foresters' (Lumbermen's) Corporation, etc.

[Shubin] According to law the entire forest belongs to the state. The state has handed control of the forests over to various organizations and agencies. The Ministry of Forestry has 74.8 percent of the forest area, the Russian Lumbermen's Corporation has 19.4 percent, the sovkhos



forests amount to 2.3 percent, the kolkhoz forests amount to 1.3 percent and others account for 2.2 percent.

[Klimenko] And the "others," who are they?

[Shubin] The Ministry of Defense, the Ministry of Internal Affairs, for example.

[Klimenko] There are many masters, but who is the main one? Who is in charge of the intelligent use of the forest stocks? In our view it is essential to organize the system for managing the forestry complex, but how?

[Shubin] Until 1985 the RSFSR Ministry of Forestry was the main holder of forest stocks. Then in the 1985-1989 period 200 million hectares of forest land were transferred, by decision of the Union Government, to the former USSR Ministry of the Forest Industry to be organized into comprehensive forestry enterprises based on logging companies and other forestry units for the purpose of ensuring the continuous and inexhaustible use of the forests. However, monitoring by forestry organs has shown that at a majority of these comprehensive enterprises, the immediate efforts to procure and supply forestry materials have squeezed out concerns about the forest and its future. The comprehensive enterprises are continuing to cut designated felling areas (in the Karelian SSR and in the Arkhangel and Sakhalin oblasts). As a result, the rules of forest usage are being violated and damage to the forests is increasing.

Based on the authority of soviet organs, the state forestry enterprises of the RSFSR Ministry of Forestry should be the owners of the forests. They are called on to ensure the reproduction and efficient utilization of forestry resources. State, cooperative, Union-wide and other kinds of enterprises, institutions and organizations, as well as individual citizens, can have the right to use the forests.

All this was reflected in the draft USSR Forestry Code, which was prepared and handed over to the RSFSR Supreme Soviet for consideration.

Given that the main purpose of the comprehensive forestry enterprises in the forestry procurement sector is the procurement and processing of felled timber, their ownership of the forestry stocks is simply counter-indicated.

[Klimenko] You permit the leasing of forests for use even by private persons?

[Shubin] And why not? Given—as a mandatory condition—that this use is carried out in strict accordance with the existing legislation.

[Klimenko] And who will control this?

[Shubin] The Ministry of Forestry. That is, after all, its direct concern.

[Klimenko] I would like to clarify another question, which is no less delicate. A forest is not only plants, but also animals. The worsening living conditions pose a threat to the forest inhabitants. Letters to the editor tell us that poachers are becoming more brazen. And the people who must stand up to them are paid miserable salaries and have few rights but great opportunities to pay with their lives.

[Shubin] I completely agree with you. It is essential to formulate and put into practice a system of material incentives. Why not, for example, establish a procedure under which part of the fine collected from a violator of the law would go to the game wardens? And the social problems of the forestry workers require solutions as well.

[Klimenko] The forest and hunting. These two concepts, in my opinion, are inseparable. What could you say on this subject?

[Shubin] I can add that hunters are yet another kind of "master" of the forest. At the present time the hunting and trapping which is done in Russia, including that which is done in state forests, is carried out by a special service which is subordinate to the Main Administration for Hunting of the RSFSR Ministry of the Agricultural Industry. Concerned as it is with the reproduction and regulation of the numbers of wild animals, this service frequently fails to take forestry interests into consideration, thereby inflicting substantial harm to them.

For the purposes of improving mutual relations between hunting and forestry, the RSFSR Ministry of Forestry considers it advisable to grant hunting lands to state, cooperative and lease enterprises, to association and public organizations, to joint enterprises and organizations in which Soviet and foreign juridical persons participate, as well as to citizens who have received, according to the established procedure, the right to hunt on the basis of a lease contract.

In this regard the leaseholders are obligated to maintain on the established territory an optimal number and density of hunting animals and to take measures for the timely and complete sale of their animals.

If the number of wild animals exceeds the optimal level and thus inflicts damage upon the forest, the leaseholders must compensate for this damage and face administrative action, financial liability or criminal responsibility.

[[Klimenko] What role do forest fires play in the range of forestry's ecological problems?

[Shubin] The fire situation in the RSFSR forests remains difficult. Both the aviation and ground fire-fighting services are insufficient; they lack powerful, high-capacity equipment to combat forest fires or the means to acquire it. The fire-chemical stations have only 30-70 percent of what the norms specify for fire-fighting agents, transportation and means of communication.

Moreover, this is, as a rule, obsolete, worn-out equipment, a third of which should be written off.

A serious situation has developed with the financing of aerial forest protection. This results from the inadequacy of budget appropriations stemming from the significant increase in the rates for aircraft rented from civil aviation enterprises. The shortage of funds amounts to R7.8 million. It goes without saying that this circumstance, as well as the unfavorable weather conditions of the current season, has contributed to the creation of an emergency situation in a number of regions in the republic (in Yakutiya and in the Magadan, Novosibirsk, Chelyabinsk and other oblasts).

[Klimenko] Valeriy Aleksandrovich, if I leave your office now and cross the street against the red light, a policeman can fine me R10. How many trees have to die before a similar "honor" is "merited?"

[Shubin] For a long time ago there has been a need to change the legislation and to introduce the concept of an "ecological crime."

[Klimenko] Yes, and other concepts such as "ecological education." We hope that this interview is a step in that direction.

Author's note: I proposed to the minister that we should take a picture of him to illustrate the interview. To this Valeriy Aleksandrovich answered: "It would be better to take a picture of a forest..."

### **Russia Advocates United Efforts To Solve Nuclear Problems**

*LD2503133292 Moscow TASS International Service  
in Russian 0605 GMT 25 Mar 92*

[By ITAR-TASS correspondent Nikolay Maslov]

[Text] United Nations, 25 Mar (ITAR-TASS)—The situation in nuclear power engineering from the viewpoint of its safety necessitates close attention by the international community as well as united efforts to solve problems on a specific, businesslike basis, rather than on an impulse. This was declared at a news conference at the UN headquarters on Tuesday by members of the delegation from the Russian Federation who are taking part in a session of a preparatory committee of the conference on environment and development, which is due to take place in Rio de Janeiro this summer.

Mikhail Kokeyev, head of the Russian Foreign ministry Directorate of International Scientific and Technical Cooperation, noted that all nuclear power stations could be shut down, but this would lead to a deep economic crisis. The session of the preparatory committee has shown that most countries have already decided on the level of representation in Rio de Janeiro. It would only be expedient for Russia and other members of the CIS to follow the relevant UN recommendation. It is important

for the new independent states that have become members of the United Nations to fully participate in the preparatory commission and in the conference itself.

Vladimir Kazakov, expert on international affairs and external economic ties of the Russian Federation Supreme Soviet, noted that at present Western countries are studying the question of lifting restrictions on the transfer of modern technology to the former USSR republics and that it is of prime importance to use this technology in order to ensure a reliable functioning of control systems in nuclear power engineering. It is necessary to pay close attention to the reconstruction of a number of power stations, but in general the problem of closing down nuclear power stations should be decided in close cooperation with the world community.

V. Kazakov said in a conversation with the ITAR-TASS correspondent that the time has come to stop enthusing about global concepts and to concentrate on solving local problems on Baykal, the Aral Sea, and other regions. Central authorities are unable to control the processes which are taking place in the provinces, and only through public efforts and actions coordinated with the international community will it be possible to radically change the ecological situation in the country for the better.

### **Potential Ecological Threat From Missile Fuel Leaks**

*MK2503120092 Moscow NEZAVISIMAYA GAZETA  
in Russian 25 Mar 92 pp 1, 2*

[Pavel Felgengauer article under the rubric "Disarmament": "Former USSR's Missiles: Fuel Is More Dangerous Than Warheads. Thousands of Tons of Poisonous 'Heptyl' Missile Fuel May Escape As a Result of Russian-Ukrainian Confrontation"]

[Text] All U.S. ballistic missiles, both ground- and sea-launched, are "filled" with a solid missile fuel—a highly energetic fuel polymer (faintly resembling powder). However, most Soviet strategic missiles use a liquid fuel—heptyl (nonsymmetrical dimethylhydrazine).

This fuel has tremendous potential energy. Heptyl is more efficient than kerosene, which is used in space rockets. It self-ignites when combined with an oxidant (nitric acid), is cheaper than solid missile fuel, and can be stored under nitrogen under pressure in the fuel tanks of a launch-ready missile for up to 20 years (the guaranteed storage lifetime is 10 years).

Fuel that has become unusable as a result of protracted storage is drained, dispatched to the plant, and cleansed via distillation of the accumulated undesirable impurities (metal from the fuel tank walls and water). After purification the heptyl is returned to the Strategic Rocket Forces (SRF) for reuse.

Deployment of Soviet solid-fueled mobile intercontinental missiles began in the eighties. One of the new systems, the R-22 (SS-24 in the American designation),

was developed as a rail-mobile system, but only 33 missiles were deployed on flatcars and 56 were placed in the silos of the SRF's Pervomayskaya Division in Ukraine, replacing liquid-fueled R-18's. Thus the first solid-fueled silo-based missiles appeared in the USSR.

Overall Soviet liquid-fueled strategic missiles are not (at present) inferior to American solid-fueled delivery vehicles in terms of 24-hour readiness to deliver a "retaliatory" strike, and they are superior to their foreign counterparts in terms of warhead throwweight.

But there is a flip side to this advantage. Heptyl is a highly toxic neuroparalytic, carcinogenic, and asphyxiating substance. Its maximum permissible concentration in air is 0.00001 milligrams per cubic meter (10 grams per cubic kilometer). The maximum permissible concentration in water is 0.02 milligrams per liter (20 grams per cubic kilometer).

Heptyl is similar to combat toxins in its properties, but in many respects it is substantially worse and more dangerous. Upon contact with oxygen in the air heptyl oxidizes, forming a large number of chemical compounds even more toxic than the original substance. Heptyl is readily soluble in water. Solutions are six orders of magnitude less toxic than heptyl in gaseous form, but they can penetrate deep into the soil, thereby creating a long-term seat of contamination (including for water supply sources). Small, sublethal doses of heptyl possess pronounced carcinogenic properties.

Dangerous accidents involving heptyl have occurred already. For instance, on the night of 1 February 1988 an accident occurred in Yaroslavl, 300 meters from the bridge across the Volga: A railroad tank car containing heptyl tipped over and several hundred kilograms of the substance poured out onto the ground (just a small proportion of the amount in the tank car). Everything was more or less okay on this occasion: The substance did not get into the Volga and did not ignite (it is lucky it was winter). Nor was the population of the city evacuated (in order to avoid creating panic). A zone with a radius of 500 meters was cordoned off. A school and a kindergarten were inside the zone, and the entrance of the famous tire plant was precisely 500 meters away. But they decided not to halt production. Gas masks were handed out, but few people took them, and residents were evacuated from nearby homes, although, according to eyewitnesses, many people stayed at home and merely closed the windows. They did not know exactly what had been spilled. They did not believe there was a serious threat. No one tried to make them change their minds. Officially it was said that a "toxic substance" had been spilled, but our wise population knew it was missile fuel, though it did not know what kind. The spilled heptyl was collected (12 people who took part in eliminating the accident were hospitalized), and the contaminated soil was removed (as after radioactive contamination) and carted off for burial.

Heptyl is now no longer produced in the country, but there is more than enough already in existence. Practically all the available heptyl is in the fuel tanks of strategic missiles, and there are no reserve containers in the country into which it could be drained if the mass dismantling of strategic delivery vehicles begins in implementation of the START treaty and of the Bush-Gorbachev-Yeltsin peace initiatives. Moreover, specialists claim that in principle no safe technique for destroying heptyl has been developed.

Until now heptyl has not been destroyed—the task was simply never set. If obsolete missiles were removed from service, the fuel was drained, distilled, and poured into new missiles, and the missiles themselves were removed from the launch silos and dispatched for "neutralization" to special arsenals, of which there are three in the country (each in a different republic). There the missiles are treated with compressed steam in special units in order to remove the several hundred kilograms of heptyl remaining in the tanks and pipes. The processing of a single "item" results in the formation of several tons of poisonous effluent, which is then burned off in special units, which requires a great surplus of solar oil (500-700 tonnes per "item"). Clearly, if we were to attempt to use this method to make safe even half the existing heptyl, it would require several tens of millions of tonnes of solar oil, which the country is in any case short of. As a result of this even now missiles removed from service spend months on spur tracks at the arsenals awaiting their turn for "neutralization."

However, under the old "administrative-edict" system the problem of heptyl would eventually have been solved somehow. Appropriate storage facilities would have been constructed, then they would have decided what to do with it. Now that the Union has disintegrated, it is totally unclear who in fact should deal with this. After all, strategic missiles are stationed on the territory of not only Russia but also other newly independent states.

In Ukraine: the Khmel'nitskaya SRF division—10 regiments of R-18's (SS-19's); the Pervomayskaya SRF division—four regiments (out of 10) have the same R-18's. Thus around 140 R-18 missiles are stationed on Ukraine's territory. In all on the territory of the former Union there are 300 such systems; the largest base is in Russia. In all there are over 5,000 tonnes of heptyl in Ukraine. Each SRF division has three squads of drainage teams. And each division has four containers (100 cubic meters) for heptyl, one empty, for unusable fuel, and three full containers in case the Americans do not manage to destroy everything on the first day of a war and it is possible to load a few missiles into the few surviving silos, fuel them, and launch them after the main salvo. In all, there are now no more than 100 special containers for the transportation of heptyl in the CIS, so the mass drainage of fuel is basically impossible—there are not enough trained specialists, there are no containers, and so forth.

In Kazakhstan: around 100 R-20 (SS-18) "heavy" missiles, which contain twice as much heptyl as the R-18's. In total, 308 R-20's are deployed on the territory of the former Union.

For the present no one is after the missile complexes in Kazakhstan, whereas Ukraine has stated that it would like to eliminate the strategic nuclear weapons on its territory by the end of 1993. That is a noble aim, but how can it physically be achieved? What would seem to be the simplest solution—"firing" the missiles (with dummy warheads, of course) into the Pacific Ocean, where there is a missile test range in Kamchatka—threatens Ukraine's population with incalculable disasters.

Toxic exhaust gases are produced during missile launches (the products of incomplete combustion of heptyl). Moreover, the first stage falls to earth 20 km from the launch site and contaminates an area with a radius of 5 km, since it contains around 700 kg of unused heptyl in the tanks, pipes, and the motor's cooling system. So R-18 missiles have never been launched from Ukrainian territory. The only place in the CIS where single (planned) test launches have been carried out is a test site in desert terrain in Kazakhstan (Tyuratam). And the place where the first stage falls to earth would be tracked by radar, the stage would be picked up, and it would be sent off for "neutralization." It is easy to imagine the possible result of regular launches of such missiles in densely populated Ukrainian oblasts.

However, something else is also obvious: The mass launch of all Soviet liquid-fueled ballistic missiles (there are over 1,000 of them in service) during a nuclear war would inevitably have meant that a considerable part of the country would have been utterly poisoned. This point can be seen as serious indirect proof that the Soviet Union never seriously planned a first, "disarming" nuclear missile strike, despite the repeated accusations of probable enemies. For the launch of its own missiles in itself would have inflicted irreparable harm on the country. It is perfectly obvious that such a suicidal action is possible only as a retaliatory strike in "retribution," when everything has already been destroyed by American bombs and there is nothing left to feel sorry for—all that is left is to die, but to go out with a bang.

Today in 1992, world nuclear war seems unlikely, but that does not make the "doomsday" missiles any less dangerous, although (according to President Yeltsin's assurances) they are no longer in fact targeted on anywhere. On the contrary, the danger of a disaster is increasing with every passing day. The point is not only that it is unrealistic to dismantle the R-18's stationed in Ukraine by the end of 1993. That problem, although difficult, is in theory soluble. The main danger today lies elsewhere: The disintegration of the Union and the mounting economic and political friction between Ukraine and Russia have now essentially destroyed the Soviet rocket forces' formerly unified supply system.

Around 400 enterprises involved in producing "items" and components for the SRF are located on Ukraine's territory. And the "Yuzhnoye" association is the main military missile manufacturing enterprise in the country. In accordance with the system of total specialization adopted in the USSR, most of the production units are unique. Thus Ukraine produces a number of key "items," warhead casings and much else besides are assembled there. Today all enterprises of the Ukrainian military-industrial complex are "on the rocks"—you need to obtain a license and a quota in Kiev for any "export" to Russia. Moreover, the Russian leadership too has tacitly decided to achieve total autonomy in the defense sphere within two years, and even in 1992 state orders for military equipment and material and technical supplies will not (so far as possible) be placed outside Russia. Purchases of military equipment have been sharply reduced, and no one has any intention of "feeding" foreign enterprises when their own Russian ones are going hungry.

A trade and economic war in which each side is in a hurry to strike another blow is under way.

#### Document

Order of the Chief of the Ukrainian Defense Ministry  
Main Staff

No. 112/22 of 12 February 1992

To the Commander of Military Unit 16461

...Products and stores situated on Ukraine's territory and in the charge of your unit should not be dispatched to other regions (pending a special order).

[Signed] Major General Zhivitsa (now Lieutenant General—P.F.), acting chief of the Ukrainian Main Staff

Military Unit 16461 is one of the main SRF supply bases on the territory of the former Union (the others are outside Ukraine). The "products list" there is largely not produced in Russia. Indeed, all the bases are rather specialized, so each SRF division is supplied from all five bases. But now supplies to Russian facilities from Ukraine have been stopped, and similarly supplies to the Pervomayskaya and Khmel'nitskaya divisions from Russia have been stopped in response. As a result within the next two or three months the schedule for the planned replacement of components and technical servicing of both the missiles themselves and of other components of the complex facilities of missile bases (refrigeration center, generator units, and so forth) will inevitably be disrupted. The general designers of the missiles will deprive their "items" of guarantees regarding reliability because the technical conditions have not been complied with. And then all we will be able to do is wait until a technical malfunction (a power outage, a breakdown in refrigeration equipment, a "sticking" relay) results in a leak of toxic fuel, fire, and explosion. Though it weighs many tonnes, the "lid" of the missile silo will be simply blown aside and a cloud of



poison gas and maybe also atomized plutonium will escape and cover surrounding fields, rivers, villages, and cities.

According to my calculations, in theory a single R-18 missile can poison 3 million cubic km of air. A single R-20 missile can do twice as much damage.

The increasing breakdown of the SRF into "national" parts and the associated decline in discipline may also lead to unsanctioned launches of strategic missiles. In any case much land will inevitably be contaminated and become uninhabitable and rivers and reservoirs will be poisoned for many years to come, including in the most densely populated regions of the former Union. It is not impossible that thousands or, in the worst-case scenario, millions of people will die.

It is a matter of months rather than years. After all, nuclear power and other centralized dangerous production facilities are now in approximately the same position as the SRF. The CIS presidents, who are meeting monthly, will scarcely be able to prevent an inevitable nuclear-chemical catastrophe that will make Chernobyl look like a medium-sized and not all that serious accident.

Obviously, there were all too many dangerous secrets in the former Union, and there is no certainty that something worse than heptyl and missiles fueled with it is not still lurking on the territory of the secret archipelago of the military-industrial complex. But the people who by virtue of their official position know how dangerous the present situation is and can see the possible consequences of the inevitable accidents are unable to decide anything. Specialists educated in the Soviet school of total secrecy are trained to write memorandums to their bosses. But now that the centralized system has disintegrated and each republic has its own independent incompetent government, memorandums are useless.

There is no longer any single authority that can decide anything, however badly. At best the reports reach some sovereign boss (president) who, however much he might like to, is powerless to do anything and is incapable of reaching agreement with his many fellow presidents about anything. Each has gotten not so much a "sovereign country that is a member of the United Nations" as a fragment, meaningless by itself, of a complex (secret) machine. Only as a result of open debate, which will inevitably bring to light many carefully kept secrets that present a threat to the CIS countries and the world in general, can the necessary public pressure be created to force the independent presidents to act with at least some sense and coordination on the question of dividing up the armed forces of the former USSR.

### Energy Shortage Rules Out Closing Down Nuclear Reactors

PM2903131692 Moscow KOMSOMOLSKAYA  
PRAVDA in Russian 28 Mar 92 p 2

[K. Belyaninov report: "How Much Would It Cost To Close Down 16 Reactors?"]

[Text] The incident at the Leningrad AES [nuclear power station] has started people talking about Chernobyl again. The arguments about the safety of RBMK-type reactors, which had seemed to be dying down, have filled the pages of the Western press, while Germany's ecology ministry demanded the immediate closure of all 16 "Chernobyl-type" units operating in the CIS.

"There can be no question of closing down the power stations," came the reply from the Russian Ministry of Nuclear Power [Minatom]. "Given the present shortage of electricity, we simply cannot voluntarily deprive ourselves of the 12 percent of our energy capacities that the AES's provide."

Despite claims by Ministry of Nuclear Power specialists that the safety of the 11 RBMK reactors located in Russia is up to all international standards, Western experts insist that they should be modernized. True, given the present economic situation in the CIS countries there simply is not the money for this: According to IAEA [International Atomic Energy Agency] estimates, the modernization of each reactor would cost \$2 million.

"The EC has been promising us 60 million ecus [European currency units] for two years now, but we have not seen the money yet," Yevgeniy Ignatenko, chief of an administration at the Ministry of Nuclear Power, says.

However, in the opinion of nuclear experts, the fuss made over the Leningrad AES is not "ecological," but purely commercial in nature: Russia, as well as Sweden and Germany, is participating in the competition announced by Finland for the construction of the next unit at the AES there:

"By talking about our power stations' shortcomings, they simply hope to deprive us of an advantageous contract that promises profits running into billions."

### Local Authorities, Public Protest Yeltsin Novaya Zemlya Decree

PM3003155592 Moscow ROSSIYSKAYA GAZETA  
in Russian 30 Mar 92 First Edition p 1

[ROSSIYSKAYA GAZETA/ITAR-TASS report: "Unknownst to People of Novaya Zemlya"]

[Text] A rally of people opposed to the Russian president's decree on Novaya Zemlya was held yesterday outside the Arkhangelsk City Soviet and City Hall building. As is well known, this act of legislation envisages the possible resumption of nuclear testing at the Novaya Zemlya test site and the transfer of the Arctic



archipelago's territory from the administrative structure of Arkhangelsk Oblast to federal ownership.

Following the organs of representative power in the city of Severodvinsk and the Nenets Autonomous Okrug, the lesser oblast soviet has roundly denounced the presidential decree. The local authorities cannot agree that, unbeknownst to them, the oblast's territory could be reduced by more than 82,000 square kilometers by a "mere stroke of the pen."

#### **Incidence of New 'Ecological' Diseases Noted**

92WN0311C Moscow NEZAVISIMAYA GAZETA  
in Russian 7 Feb 92 p 6

[Article by Boris Revich of the Center for Demography and Human Ecology: "New Environmental Illnesses Appearing: Alopecia, Potato Disease, 'Yellow Children'—And That Is Not All"]

[Text] Alopecia (sudden hair loss, in this case in children) first appeared in Chernovtsy in the fall of 1989. Various explanations for the appearance of this disease have circulated, including the thallium hypothesis, since hair loss is a typical symptom of poisoning caused by that element.

A large concentration of thallium was discovered in the children's fingernails. Their urine and saliva also contained an elevated quantity of boron, giving rise to the hypothesis that they were suffering the toxic effects of boron fluoride. It is possible that brick plants located in the center of the city burned waste materials containing compounds of boron and fluorine, resulting in the formation of a toxic gas. Also supporting that theory was the disappearance of cockroaches, which are particularly sensitive to the effects of compounds containing boron.

Another incidence of alopecia in children occurred in early 1989 in the industrial city of Sillamae in Estonia, an area with highly developed oil shale mining and processing. Over a period of several months over 200 children became ill.

A high concentration of trace elements—cadmium, bismuth, lead, boron, and other components in the ash from oil shale burning—were found in soils and plants, in cow's milk, and in the water.

In addition to alopecia, children in that area had a rate of allergies and abnormal arterial blood pressure three to four times higher than the norm. Similar changes were recorded in experiments on animals given water and food from that city. The disruption of their reproduction functions were similar to abnormalities in pregnancy and childbirth observed among the mothers of the affected children. One of the reasons for the tragedy is believed to have been a mine fire in late 1989 which caused a large one-time discharge of combustion products and lead ash.

Still completely unexplained is the cause of the "potato disease," a toxic polyneuropathy which affected students harvesting potatoes in an area of the Urals. This disease was first observed in 1989, at which time 30 people were hospitalized. Over a three-year period 222 people have become ill. The systems of the disease are repeated year after year, with the so-called "club foot" the most typical: in those affected the tarsus of each foot becomes rigid. According to the latest theory the cause was a new generation of imported pesticides: pyrethroid, tsimbush [as transliterated], and simmundine, sprays of which were prepared with major deviations from manufactured-specified procedure. That same year Altay Kray was the scene of a sharp increase in the number of infants born with central nervous system damage, up to 60 percent, with all the newborns exhibiting a yellow skin color, evidence of an extremely high bilirubin level in their blood. Some of the cases proved fatal. The first known cases of these "yellow children" have been linked to a fire at an open pit mine where ores with a high concentration of lead, cadmium, and zinc were mined. However, causes of jaundice have also been found in another town 400 kilometers away. The mothers show signs of anemia, and hexachloran, DDT, and heavy metals were found in their breast milk. At the present time a major research program involving many experts is underway in that region to discover the causes of the illness and to eliminate them.

The diseases described above were caused by as-yet-unexplained factors. But over the past two years there have been several major chemical disasters, the effects of which have not yet manifested themselves. These include an accident at an oil refinery in Ufa (Bashkiria) as a result of which the concentration of phenol in the drinking water supply exceeded public health limits many times over.

On 12 September 1990 one of the largest industrial accidents in world history occurred at a beryllium powder manufacturing facility in the city of Ust-Kamenogorsk (Eastern Kazakhstan). The amount of metal discharged was at least 40-60 kilograms. The average amount of time the residual cloud continued to have an effect was three to six hours, and the actual concentration of beryllium in various parts of the city exceeded the maximum permissible airborne concentration by factors of five to 137; recently the concentration has been one to five times higher than maximum permissible levels. One day after the accident the beryllium concentration exceeded the maximum permissible concentration by factors of 1.1-5.4 in some areas. Approximately 120,000 people living within an area of 40 square kilometers were exposed to the high concentrations. No severe beryllium-related injuries were reported immediately after the accident, nor were specific changes in the health of the population observed three months later. However, the long-term health effects of this accident may surface later.

It is clear that the present economic chaos in our country, violations of technological discipline, and the

emergence of a "wild" market will inevitably lead in the near future to a series of new chemical disasters, and new environmental illnesses may emerge along with them.

### Rise in Moscow's Mortality Rates Attributed to Pollution

92WN0311B Moscow NEZAVISIMAYA GAZETA  
in Russian 13 Feb 92 p 6

[Article by Nikolay Gorbachev, Viktor Nekrasov, and Georgiy Skvortsov, Moscow Ecological Federation members: "Muscovites' Privilege—A Higher Mortality Rate: The Capital of the Former USSR Vies for the Title of Most Polluted City in the World"]

[Text] Muscovites breathe air that is full of emissions originating with industry and transportation. Average annual expenditures by Moscow enterprises and organizations for environmental protection purposes total less than one percent of their profits. In the United States an average of \$320 per capita is spent for environmental protection annually, whereas in the former USSR this figure is 39 rubles [R], and in Moscow only R10.

Toxic and carcinogenic emissions from industry and motor vehicles in Moscow contain: solids—2.6 percent; gaseous and liquid substances—97.4 percent. These emissions consist of: carbon monoxide—61 percent; nitric oxides—12.9 percent; hydrocarbons—10.8 percent; sulfuric anhydride—4.9 percent; miscellaneous—7.8 percent. This sort of environment causes many ailments in human beings: oxygen deprivation, coughing, watery eyes, dizziness, headaches, nausea, ringing in the ears, fainting spells, rapid heartbeat, numbness in the extremities, irritation of the skin, disintegration of mucus membranes of the eyes and the lungs, disruption of the nervous system and cardiovascular system, and high blood pressure.

The huge emissions of pollutants into Moscow's atmosphere result in an average mortality rate per 1,000 Muscovites that is one-third higher than that for residents of other major cities in our country. Unfortunately that rate is rising every year. The number of Muscovites who died in 1990 as compared to 1989 increased by 10.4 percent. In 1990 the city for the first time experienced a natural population loss, with the mortality rate exceeding the birth rate by 21.7 percent.

The organism of a child in its formative stage is the most sensitive to environmental changes. The rate of illnesses among Moscow children in comparison to average rates for the country as a whole were as follows: respiratory ailments—higher by a factor of 2.3; digestive system ailments—higher by a factor of 2.1; ailments of the nervous system and sensory organs—higher by a factor of 2.5; all forms of neoplasms—higher by a factor of 4.0; ailments of the urogenital system—higher by a factor of 4.0; skin diseases—72.6 percent higher.

The principal reason for air pollution from point sources is the low quality of air filtration equipment in the

majority of rayons in Moscow: Gagarinskiy, Solntsevskiy, Leninskiy, Sevastopolskiy and Kuybyshevskiy Rayons have capture rates of two to nine percent; Kiyevskiy, Sovetskiy, Timiryazevskiy, Cheremushkinskiy, Moskovskiy, and Zelenogradskiy Rayons—17-30 percent; and Zheleznodorozhnyy, Dzerzhinskiy, Tushinskiy, and Sverdlovskiy Rayons—34-44 percent. Particular harm is done to the city by heat-and-electric-supply stations, which discharge hundreds of thousands of metric tons of toxic substances into Moscow's air every year. Over 70 percent of all harmful emissions come from motor vehicles. Poisoning of the air by motor vehicle exhaust is reaching an alarming level in the city. Not only is human habitation not permissible in the vicinity of certain heavily polluted streets and squares, it is not even tolerable for human beings to remain there for any length of time. For example, in the vicinity of the Shchelkovskiy Bus Terminal the carbon monoxide concentration in the air exceeds the permissible maximum level by a factor of 10, the nitrogen peroxide concentration by a factor of 2.0, and the formaldehyde concentration by a factor of 2.9.

The large number of dumps and the intensive pollution of Moscow streets and courtyards are also causing an increase in the rate of illness among city residents. As a result of inadequate waste disposal areas, the city buries something on the order of 1 million metric tons of industrial and household wastes in unauthorized dumps every year.

### St Petersburg Becomes Part of Global 'Healthy Cities' Project

LD1603141792 Moscow TASS in English 1135 GMT  
16 Mar 92

[By ITAR-TASS correspondent NikolaY Krupenik]

[Text] St. Petersburg, March 16 (TASS)—"It is immoral to talk about the rebirth of the city while doing nothing to help concrete people living in St. Petersburg. It is pointless to plan the future without caring for the young generation, its spiritual and physical health", said Anatoliy Sobchak, mayor of St. Petersburg. He is among those who suggested that the five-million inhabitant city in the north of Russia join in the international project "healthy cities of the globe."

The action was begun several years ago by more than 30 cities, each with a population of many millions. The action is held under the auspices of the World Health Organisation.

The motto of politicians and public leaders, medics, jurists, charities and business people is revival of the urban environment, the shaping of a healthy way of life, protection of the population's health and development of medical services.

The proposals coming from the city on the Neva met with understanding and support of the founders of the

global project. St. Petersburg was proclaimed the 35th participant in the global ecological project.

"Many people need social protection, but still we have singled out the priority social group needing protection. They are single and poor young women—expectant mothers", Nellie Bederova, executive director of the St. Petersburg Chapter of the "healthy cities" project, told ITAR-TASS. "Our colleagues abroad met this suggestion with understanding and sincere compassion. We look for funds towards the humanitarian programme 'maternity and childhood'.

Professor Marsdent Wagner, expert of the World Health Organisation, who came to St. Petersburg to analyse the state of maternity homes, children's homes and pre-school institutions, believes that birth rate in the city is on the decline and that the number of new-born babies with congenital diseases is on the rise. Therefore, the priority of "maternity and childhood" programme is unquestionable.

Professor Wagner said an attempt will be made to remedy the situation by common actions, by the supply of necessary medicines, food products and equipment for a children's rehabilitation centre near St. Petersburg.

#### **U.S. Firm Offers Waste-Burning Power Station to Omsk**

*OW1803024092 Moscow INTERFAX in English  
1903 GMT 17 Mar 92*

[Following item transmitted via KYODO]

[Text] The Great Russian-American Trading Co. (USA) has expressed its willingness to act as intermediary for \$250 million to be invested in the economy of Omsk (western Siberia). SIBIRSKAYA GAZETA reported that the proposal before the regional administration would provide for the construction of a power station with output of 64 megawatts. The station would use waste from petrochemical processes and other industrial waste produced in the region. In addition to local waste, the power station would burn waste from Italy, Germany, Switzerland, and Austria.

This final aspect of the project has generated serious objections from local environmentalists who accuse its authors of attempting to turn Omsk into the "slop-pail of Europe." Nevertheless, James Holton, executive vice president of the company, believes that the technology being offered by the Americans is the world's cleanest and most environmentally advanced.

#### **Experts Cited on Novgorod Area Cesium Pollution**

*PM1803160392 Moscow ROSSIYSKAYA GAZETA  
in Russian 18 Mar 92 First Edition p 8*

[Report by Valentina Pyankova under the rubric "They Say That... But What Is Actually Happening?": "Cranberries And Cesium"]

[Text] Novgorod—Novgorod Oblast is in a state of virtual panic. The media have reported "patches of contamination", "to be more precise, areas where the content of cesium-137, inherited from the Chernobyl explosion, is high... The news is truly alarming. We asked some authorities to comment on it.

Vladimir Savin, chairman of the oblast nature conservation committee:

"Investigations have been carried out under the state program in accordance with the Russian law adopted last year "On social protection for citizens affected by radiation resulting from the disaster at the Chernobyl Nuclear Power Station." The St. Petersburg geophysical expedition has so far only carried out a generalized survey of the oblast territory. One thing is now clear: The least satisfactory picture is in Soletskiy, Shimskiy, and Novgorodskiy Rayons, where there was frequent rain and a southerly wind in April 1986. The northeast rayons are practically unaffected. But it is too early to talk about the size of the "patches" and the number of people that could be in the zone of high radiation. The work continues. The oblast ecology fund has allocated 150,000 rubles [R] for further research and there is another R280,000 from Russia..."

Aleksandr Petrov, chief physician at the oblast center of the state health and epidemiological inspectorate:

"Let us bear in mind that, in the first place, the radiation norms, whereby a locality is deemed to have been affected by the Chernobyl explosion have now become much more stringent, and, second, the detailed study of the areas marked on the rough map as unsatisfactory is essentially only just getting under way. It will be summer before the results are known.

"I will say, though, that two years ago our service published a map, based on its own analysis, which marked the places that were not recommended for mushroom picking expeditions. Readers of the oblast newspaper will remember it. The data largely correspond to those that have been obtained now. But an area that was deemed undesirable before must now be designated dangerous. Indeed radionuclides are gradually massing in certain places—mainly in marshes, having drained down from areas of higher ground. This does not mean that we are going to have to bid farewell to the celebrated Novgorod cranberry. It will be safe to gather them, as before, on the Valday and in Pestovskiy, Lyubytinskiy, Borovichskiy, and Malovisherskiy Rayons. But it will not be safe in the Bolshoye Utorgoshskoye marsh, although it is closer to Novgorod. But, I repeat, it is better to wait for the final results of the investigation. Particularly as the berry-picking season is a long way off.

### Economic, Ecology Journal for Russia's Far East To Be Published

OW1703080592 Khabarovsk Radio Khabarovsk  
Network in Russian 1045 GMT 12 Mar 92

[Text] The present economic situation in the Far East in many ways reminds us of the situation which occurred in the region in 1922-23, and which was characterized as an economic chaos. What is more, today's economic confusion in the region is complicated by an ecological crisis. Considering the experience of past years, this begs the question: How did Far Easterners lead their kray out of the difficult economic situation in the 1920's? These thoughts must say: With honor. Here is one interesting fact from those years. In 1922, the National Economy of the Far East Republic made a decision to publish a regional scientific information journal called *EKONOMICHESKAYA ZHIZN DALNEGO VOSTOKA* [Economic Life of the Far East]. Its first issue came out in the relatively calm year of 1923. Having played the leading role in organizing a normal economic life in the Far East, the journal ceased its activities in 1929.

Today the situation in the kray urgently demands the rebirth of a regional ecological-economic journal because ecology and the economy are now indivisible. As we were just informed, the Trans Amur Ecological Society, and the Khabarovsk Kray Committee on Ecology and Environmental Exploitation, have signed a joint agreement reincarnating a 1992 version of the scientific information journal *EKONOMICHESKAYA ZHIZN DALNEGO VOSTOKA*.

### Baykal Region Environmental Problems Viewed

92WN0312B Moscow *EKOLOGICHESKAYA GAZETA*  
in Russian No 11-12, 1991 p 2

[Article by Aleksandr Domashets: "Ring Around Baykal"]

[Text] "A Glorious Sea is the Sacred Baykal." This line from the song runs through my mind again and again. It is like a caption for a panoramic picture of this great lake and its environs. Today its brow is furrowed, completely covered in wrinkles billowing in the wind. And rising around the hardened stone waves are endless mountain ranges. Landscapes, one more beautiful than another, are visible in the light of the patrol helicopter. Peak runs up against peak. From a spur emerges an unfamiliar bend in a river or a fissure-the bed of a nameless stream. There are countless numbers of them in this kingdom of mountains.

Snow "ties" hang all summer in the narrow ravines; hundreds and thousands of streams have their origins here. Their pure icy water runs swiftly down the steep slopes into valleys, merges with other streams, forming rivers. And all of them, with one exception, rush toward the lake, feeding it, creating a living ring around Baykal.

### 'The Purest and Clearest?'

But the lake has another set of surroundings, a harmful set consisting of the results of the economic, or more accurately, the "uneconomic," wasteful and ill-conceived activities carried out on its shores by men of the species "homo soveticus." At a Soviet-American meeting which took place recently in Moscow on the problem of the Baykal region, land-use expert George Davis, head of the American delegation and leader of the project, said:

"We were shaken by the degree of pollution. We were shocked by the degree of air and water pollution and the enormous number of legislative acts which—alas!—are not being carried out."

"Add to that the consequences of excessive cattle grazing, the rapacious destruction of the forests, and extensive-type agriculture."

"I have read all the works on Baykal," noted Karl Reydel, a forestry expert from the Eastern Division of the National Federation on Environmental Protection in the United States. "And my illusions have vanished. The conditions of life in this region are worse than one could imagine on the basis of scientists' reports. I view Baykal as a Siberian Chernobyl."

Scientists have studied this area more thoroughly than others, but even now two pulp and paper combines and an aluminum plant are operating on the shores of the lake. I think that once our plan for saving Baykal is completed, effective measures will be taken.

After all, it was not so long ago that we learned from school textbooks that our Baykal is the clearest and purest and will remain that way forever thanks to the planned nature of the economy. At the same time the American Great Lakes are rotting along with the entire capitalist system.

I remember pebbles on the southern shore of Baykal, with no traces of algae or mold, pebbles washed by the purest drinking water. I was on that shore in the mid-70's.

"Today the water in the southern part of the lake is, in essence, not even Baykal water," stated Zh. Chernyayev, the chairman of the Institute of Evolutionary Morphology and Ecology of the USSR Academy of Sciences.

Nor should we overlook the fact that many of the basin's problems develop beyond the borders of our country. S. Shapkhayev is the coordinator of the work on the creation of an RSFSR draft law "Concerning the Environmental Protection of the Baykal Ecological Region," a docent at the Eastern Siberian Technological Institute and a USSR people's deputy. Here are his thoughts:

"Everything is interrelated. We cannot talk about saving the Seleng River alone. Its tributary, the Egiyn Gol, flows from Lake Khubsugul, which is sacred for every Mongol.



I think that Mongolia will be more willing to join our project if it is called the Plan to Save the Khubsugul-Baykal System."

In Sergey Shapkhayev's opinion, we have been granted 5-10 years for deliberation. Moreover, the discussion is also about saving people from environmental degradation. "I do not think that it can be done in one separate region when the entire country is being degraded. Will Buryatiya cope with the plan? For the first two or three years the talk can only be about surviving and about stabilizing the situation. The economic system has disintegrated. But we must act..."

#### Give the Ocean-Sea a 'Red (Diplomatic) Passport'

Lake Baykal is compared not only to a sea, but to the ocean itself. For example, V. Avilov, a senior scientific associate at the Institute of Oceanology imeni P.P. Shirshov, who studied the deep-water portion of the lake three years ago, cited figures and showed diagrams proving that Baykal is similar to an ocean in terms of the numerical values for biologically active substances. In the same way a benthonic stratum 100 meters in depth has been isolated, and other parameters match as well. Baykal is powerful, no one will argue that, but it was not able to resist the anthropogenic factor.

"I agree with the American scientists," stated V. Goryachev, senior scientific associate at the All-Union Scientific Research Institute for Environmental Protection and Wildlife Preserves of the USSR Ministry of the Environment. "The Baykal fauna is on the brink of catastrophe. We need a 'Red Book of Baykal.' Protection of the entire lake is a difficult matter. For this reason we at the institute proceed from the principles of the 'Red Book.' The world of Baykal is unique. Its flora and fauna contain about 1,000 native forms—species which are not found anywhere else. They include 200 species of crustaceans and 120 species of molluscs.

Biogeographically Baykal is not homogeneous; the fauna is not distributed evenly throughout the lake. Every bay has its own unique community of living organisms. Scientists divide the entire region into four geographic provinces. We are talking about directly aquatic fauna. We are singling out 10 model water areas which must be protected. All the data on them will be published this year.

At the meeting the following was discussed: the need to create around Baykal a ring of wildlife sanctuaries, which will protect the lake and its basin; the development of international tourism and the process of acquiring for Baykal the status of world heritage object.

"According to Eastern philosophy," noted S. Shapkhayev, "man is part of nature and must take account of its laws. The creators of the draft law on Baykal have been attempting to take into account the interests of man and nature in order to achieve harmony in their mutual relations."

#### Together With the U.S.

After the reports by American and Soviet scientists, a roundtable discussion was held. The Soviet scientists claimed that they know what has to be done. "One gets the impression that the American scientists are not familiar with the works on Baykal and that up to now no one has worked on this problem." The plan for the permissible economic load in this region was created as long ago as 1966, they claimed. There were also questions about whether the Americans were satisfied with the level of scientific research now being carried out on Baykal by Soviet scientists. In short, the atmosphere resembled that of a party meeting. However, George Davis, having ignored the call for criticism and self-criticism, answered:

"We have been completely satisfied. I think highly of the scientific level of all the specialists with whom we have worked, and I will treat them as highly-skilled personnel. I trust the Soviet scientific community."

"Do you intend to carry out research from the ice? From the snow cover?"

"I remind you that we are not carrying out any research, we are making observations. We have come from a country with a similar climate where acid rain also falls. And if I come again, I will observe."

The traditional theme of American aid was sounded. For putting out forest fires it would be good to use water planes, as is done in the States. Is it possible to help Soviet scientists with equipment, instruments and technology? The answer to this question was reassuring.

During the meeting a concept for saving Lake Baykal—a unique body of water on the Earth—was worked out, and this, too, was reassuring.

#### Chernobyl Effects on Novgorod Area Studied

LD1603061592 Moscow TASS in English 1738 GMT  
15 Mar 92

[By ITAR-TASS correspondent Viktor Troyanovsky]

[Text] Novgorod, March 15—Areas with abnormally high contents of cesium-137 were spotted in the territory of the Novgorod region. This was established by research conducted by St. Petersburg's geophysical expedition studying the impact of the Chernobyl nuclear disaster.

Commenting on the alarming report at the request of ITAR-TASS, Ivan Popov, head of radiation hygiene department of the Novgorod regional centre of the state sanitary inspection, said that eleven contaminated zones, each with an area of from 100 to 150 square kilometres, were discovered. People residing in these areas will be under protection in accordance with the Russian Federation law "On Social Protection on Citizens Who Came Under Irradiation Effect in Connection with the Catastrophe at the Chernobyl Nuclear Power Station".



The contaminated zones will be studied in detail. For this purpose the regional administration allocated the necessary funds.

### **Russia, Ukraine, Belarus Appeal to UN for Help in Chernobyl Aftermath**

*LD2303173292 Moscow TASS International Service in Russian 1638 GMT 23 Mar 92*

["Appeal from the Heads of State of Belarus, the Russian Federation, and Ukraine to the United Nations Organization for help in Overcoming the Consequences of the Chernobyl Disaster"]

[Text] The accident at the Chernobyl nuclear power station on 26 April 1986 can, in terms of scale and the damage caused, be classed as one of the very worst accidents in the history of mankind to result from technical failure. It ranks among global disasters from the point of view of radiation contamination of the biosphere.

The Chernobyl disaster affected the lives of millions of people in many countries of the world. It continues to have a negative impact on the lives and health of people, and particularly children, above all in the affected areas of Belarus, Ukraine, and Russia.

The extreme nature of the situation is made worse by the potential danger of the "sarcophagus" and the lack of world experience in overcoming the consequences of a disaster on this scale.

Thanks to UN efforts, particularly last year, when an international program for overcoming the consequences of the Chernobyl disaster was approved, a genuine way of wide-ranging international cooperation in overcoming the consequences of the catastrophe has been outlined.

However, the sharp deterioration in the situation in the former USSR and the cessation of its existence prevented the United Nations from beginning the implementation of this idea. The three most affected UN member-states, which have appeared on the map of the world as a result of the disintegration of the USSR and have been recognized by the world, have in practice found themselves alone in facing the consequences of a global catastrophe which presents a threat to certain neighboring states as well.

Our great sense of responsibility to our peoples for the grave consequences of the accident, which will have an extremely negative effect on the lives and activities of people in the affected areas for a long time yet, prompts us on behalf of our peoples to appeal to the world community to give fresh impetus to the international program to overcome the aftermath of the accident at the Chernobyl nuclear power station.

We call on the United Nations Organization to mobilize the efforts of the world community to help our states in overcoming the aftermath of the Chernobyl disaster.

[Signed] Vyacheslav Shushkevich, chairman of the Supreme Soviet of Belarus; Boris Yeltsin, president of the Russian Federation; and Leonid Kravchuk, president of Ukraine.

### **Decree Scores Lack of Progress on Chernobyl Measures**

*92WN0311A Kiev GOLOS UKRAINY in Russian 1 Feb 92 p 6*

["Decree of the Ukrainian Supreme Soviet on the Status of Implementation of Measures Outlined in the Decrees of the Ukrainian SSR: 'On a Concept for Habitation by Population in Areas of Ukraine With Elevated Levels of Radiation Pollution Resulting From the Chernobyl Disaster,' 'On the Procedure for Implementation of the Law of the Ukrainian SSR on the Legal Regime Governing Areas Subjected to Radiation Pollution as a Result of the Chernobyl Disaster,' and 'On the Procedure for Implementation of the Law of the Ukrainian SSR on the Status and Social Protection of Citizens Affected by the Chernobyl Disaster'"]

[Text] The Ukrainian Supreme Soviet hereby decrees:

1. To note that measures to eliminate the effects of the Chernobyl disaster outlined in Ukrainian SSR [Soviet Socialist Republic] decrees and laws are not being carried out within established time limits or to their full extent.

The main reason for this situation is the fact that the government has not created an integrated mechanism for implementation of the Ukrainian SSR Laws "On the Status and Social Protection of Citizens Affected by the Chernobyl Disaster" and "On the Legal Regime Governing Areas Subjected to Radiation Pollution as a Result of the Chernobyl Disaster," or the Ukrainian SSR Supreme Soviet decree "On a Concept for Habitation by Population in Areas of Ukraine With Elevated Levels of Radioactive Pollution Resulting From the Chernobyl Disaster," nor has the way they are implemented been adequately monitored.

No scientifically based system for reconstruction of the radiation dose received by the population as a result of the Chernobyl disaster or calculation of the individual effective equivalent dose (since 24 April 1986) has been developed.

The program for resettlement of citizens from the zone of absolute (i.e. mandatory) resettlement is not being carried out. Specifically, construction of 2,500 individual homes, multistory buildings to provide 1,170 apartments, six schools, two hospitals, five kindergartens, and a number of other facilities has not been started, nor have other facilities scheduled for completion this year been completed. Goals for the reconstruction and new construction of social and consumer facilities intended to protect people from the effects of

radiation in the zones of guaranteed voluntary resettlement and intensified radiation monitoring are not being met.

A majority of oblast soviet executive committees are flagrantly violating the rights of citizens affected by the Chernobyl disaster who have expressed a desire to resettle independently from polluted areas, especially with regard to housing and employment.

Amendments and additions to current legislation have not been prepared in connection with the adoption of the Ukrainian SSR Laws "On the Legal Regime Governing Areas Subjected to Radiation Pollution as a Result of the Chernobyl Disaster" and "On the Status and Social Protection of Citizens Affected by the Chernobyl Disaster." Procuracies are not monitoring compliance by authorities, organizations, institutions, and individual officials and citizens with current legislative acts connected with elimination of the effects of the Chernobyl disaster.

2. To note a report from the Ukrainian Cabinet of Ministers on this matter.

3. To recognize as unsatisfactory the efforts made by the republic government toward implementation of Ukrainian SSR Supreme Soviet decrees pertaining to realization of legislative acts connected with elimination of the effects of the Chernobyl disaster.

4. To direct the attention of Ukrainian Prime Minister V.P. Fokin to the lack of proper coordination of efforts to implement laws and monitor compliance with them at all levels of executive authority.

5. To instruct the Ukrainian Cabinet of Ministers:

to take measures to repeal acts by ministries, agencies, and other state organs taken in regard to interpretation of the Ukrainian SSR Law "On the Status and Social Protection of Citizens Affected by the Chernobyl Disaster," if those measures are in violation of Article 61 of the present law;

to submit for the consideration of the Ukrainian Supreme Soviet within the first quarter of 1992 a long-range national program to eliminate the effects of the Chernobyl disaster and to provide social protection for the citizens who suffered from it; to create favorable conditions for foreign investment in the realization of that program;

to coordinate joint efforts by the governments of the former republics of the Soviet Union with regard to efforts to eliminate the effects of the Chernobyl Nuclear Power Plant disaster, social protection for those affected, and matters pertaining to population migration processes prompted by the Chernobyl disaster;

to draw up a list of jobs involving particularly dangerous working conditions performed during cleanup efforts following the Chernobyl disaster on government instructions in the 1986-90 period, as well as criteria on the

basis of which individuals who performed those jobs may be granted benefits and compensation as provided for in the Ukrainian SSR Law "On the Status and Social Protection of Citizens Affected by the Chernobyl Disaster";

to submit for the consideration of the Ukrainian Supreme Soviet Presidium within one month proposals concerning the determination of responsibility for failure to meet the requirements contained in the Ukrainian SSR Law "On the Legal Regime Governing Areas Subjected to Radiation Pollution as a Result of the Chernobyl Disaster," "On the Status and Social Protection of Citizens Affected by the Chernobyl Disaster," and "A Concept for Habitation by Population in Areas With Elevated Levels of Radiation Pollution Resulting From the Chernobyl Disaster";

to arrange for the quarterly publication of an informational newsletter to be entitled CHERNOBYL, in which official information shall be published on protection of Ukrainian population affected by the Chernobyl disaster and the status and dynamics of the radiation situation, including the findings of circular monitoring of air, soils, and water at various distances from the Chernobyl Nuclear Power Plant.

6. Monitoring of compliance with the present decree shall be the duty of the Ukrainian Supreme Soviet Commission on the Chernobyl Disaster.

[Signed] I. Plyushch, chairman of the Ukrainian Supreme Soviet  
Kiev  
11 December 1991

#### **Ukraine Greens Official on Lack of Political Attention to Ecological Issues**

92UN0924B Kiev MOLOD UKRAYINY in Ukrainian  
28 Feb 92 p 1

[Interview with Vitaliy Kononov, co-chairman of the Green Party of Ukraine, by Olena Hubina; place and date not specified: "Green' Problems Are For a Well-Fed Society"]

[Text] Vitaliy Kononov is the co-chairman of the Green Party of Ukraine. If he succeeds this Sunday in winning the election for people's deputy in the district of former deputy, General Dukhov, his party will obtain its first vote in the Ukrainian Supreme Soviet. Perhaps there is a paradox in the fact that in Ukraine, which has been scorched by Chernobyl and is actually suffering an ecological catastrophe, "green" issues have so far not moved to the top of the agenda. Why is that so? I asked Vitaliy Kononov this question.

[Kononov] You have broached a serious problem. It is not a matter of our party doing its job badly, but rather that economic problems have taken center stage. "Green" problems "emerge" in a well-fed society. That

is why we have stopped "noticing" Chernobyl and why there are no births in maternity hospitals today.

[Hubina] These things are interconnected: We hardly speak of Chernobyl yet we do not want to have children. Perhaps that is our solution to the problem?

[Kononov] There was more optimism in Japan, and those who survived the Hiroshima tragedy lived a year to a year and a half longer on average than the Japanese as a whole. This is because at the beginning the Americans helped fight the effects of the tragedy, and there was assistance from the state: various benefits for the victims of Hiroshima, a good diet, and medical attention.

[Hubina] Our Supreme Soviet and the president rarely raise ecological issues.

[Kononov] The Green Party did not yet exist when the elections to the Supreme Soviet were held. Seats were fought over by individuals who raised ecological issues in their pre-election platforms. That is why we have the "kamikaze" Shcherbak in the government, while we sit in the balcony in parliament. Today the Green Party has decided to test itself.

[Hubina] You sound optimistic, even though it is possible that this Supreme Soviet will soon be dissolved.

[Kononov] Victory for me is not an end in itself, and I am not taking part in this election because of personal ambitions. My election platform is the program of the Green Party. It consists of defending the people's right to life and the quality of their life. Our priorities are ecology, antimilitarism, and protection of the socially deprived. That is why it is important for us to be heard and important that these issues not be pushed back from the forefront of public consciousness.

[Hubina] Ecological problems cannot be solved in just Ukraine alone. And so, even if we do not like some of our neighbors, we are still "destined" to act jointly in protecting the environment.

[Kononov] The Greens in the West do not perceive us in the way we would like to be perceived. We are accused of nationalism. Meanwhile, the Green Party of Ukraine is shaping the "green" policies of Eastern Europe. We want to conduct an international conference and create a center of all East European Green parties in Kiev.

[Hubina] Ukraine has promised in the international arena to rid itself of nuclear weapons. At the same time, there are rumors that the moratorium on the construction of nuclear power stations will be lifted...

[Kononov] The latter trend is dangerous. Following the Chernobyl catastrophe, the Swedes rejected nuclear power. At present, we are short of power, but a large percentage of our energy supply is used by the military industrial complex. The nuclear lobby is seeking rehabilitation. As for nuclear weapons, we are obliged to liquidate them. Ukraine has an historic opportunity to become nuclear-free. But it is madness to hand over

these weapons to Russia. We should probably reach an agreement with neutral states and do this under international supervision. Our party is in favor of creating nuclear-free zones in Ukraine.

### **Chernobyl Energy Unit Conversion Competition Announced**

*PM1003144592 Moscow ROSSIYSKAYA GAZETA in Russian 6 Mar 92 First Edition p 1*

[Report from roundup of ROSSIYSKAYA GAZETA and ITAR-TASS reports: "International 'Shelter' Competition"]

[Text] The Ukrainian prime minister's press service has announced that the republic's cabinet of ministers has decreed that an international competition be held through 1 October 1992 to develop a plan and technical solutions to turn the destroyed fourth energy unit of the Chernobyl nuclear electric power station (project "Shelter") into an ecologically safe system. The competition will be held by the Ukrainian Ministry for Chernobyl and the republic's Academy of Sciences involving the Ukrainian department of the world laboratory international center for scientific culture. Prizes of the cabinet of ministers have been set for the competition winners: one first prize of \$20,000, two second prizes of \$10,000 each, and five consolation prizes of \$5,000 each.

### **Incidence of Disease Increasing in Ukraine's Radiation-Affected Areas**

*PM1103104792 Moscow ROSSIYSKAYA GAZETA in Russian 10 Mar 92 First Edition p 7*

[Report from ITAR-TASS roundup under the "News Items" rubric: "Ukraine"]

[Text] The number of serious illnesses contracted by people resident in areas polluted by radionuclides is increasing. In 1986 the incidence of cancer of the thyroid gland in children stood at 0.13 percent per 1,000. Last year the number of such diseases had increased 17 times.

The largest number of patients is coming to light in Gomel Oblast. Increased incidence of diseases of the upper respiratory tract, the gastrointestinal tract, the endocrine system, and the blood circulation system is being observed almost everywhere, and there has been an increase in the number of various pregnancy and immunity disorders.

### **Contaminated Meat Buried in Chernobyl Area**

*LD1603143192 Moscow TASS in English 1156 GMT 16 Mar 92*

[By BELTA-TASS correspondent Aleksandr Lyushkevich]

[Text] Minsk, March 16 (TASS)—According to Belarusian press reports, 400 tons of meat had to be buried in

Chernobyl area after a radioactivity check. Another 920 tonnes of contaminated meat is to be destroyed by the end of June.

Why is contaminated meat still being produced? Who is violating the technology recommended by scientists? Why is meat being rejected only at the very last stage? Does it all land up in special storages for biologically radioactive wastes, located in Narovlyansky district?

Experts from the Republic "Chernobyl" State Committee claim that no radioactive meat can ever appear on sale and that the safety or burial places for such wastes is fully guaranteed. Nevertheless they complain that the process of burying contaminated cattle from private husbandries is practically beyond control. Farmers are known to have buried some of them next to populated localities thereby allowing radioactive substances to seep into underground waters to be carried away into rivers and lakes.

Six years have elapsed since the Chernobyl tragedy, but, unfortunately, ever new problems are cropping up and have to be resolved without fail.

#### **Belarus Government Wants Funds From Russia To Clean Chernobyl Area**

*OW1603223992 Moscow INTERFAX in English  
1554 GMT 16 Mar 92*

[Following item transmitted via KYODO]

[Text] On Monday, the Belarussian government discussed the possibility of securing a Russian interest loan of 25 billion roubles, to eliminate the consequences of the Chernobyl accident.

Vice-Chairman of the Belarussian Chernobyl Committee Anatoliy Zubovskiy, told IF [INTERFAX] that although the CIS leaders had signed an agreement, the aid coming from the former Soviet republics was very small.

He described as unfair Russia's and Ukraine's proposal to jointly finance clean-up operations through a common Moscow bank with equal participation of the three republics.

Speaking about the position of the Belarussian government, Anatoliy Zubovskiy said that since Belarus suffered from 70 percent of the radioactive fall-out and the Chernobyl nuclear power plant was in a neighboring state which had never been under Belarussian jurisdiction, the share of Belarus in financing the clean-up operations should be much smaller than those of Russia and Ukraine.

#### **Alma-Ata Institute Pioneers Nuclear Monitoring Equipment**

*PM1203112192 Moscow Russian Television Network  
in Russian 1420 GMT 7 Mar 92*

[From the "M-Trust" program: Video report by A. Kondrashov and A. Svyagin, from Alma-Ata]

[Text] [Kondrashov] The [Alma-Ata] Nuclear Physics Institute is well known in Kazakh scientific circles. Kurchatov himself helped to establish it 35 years ago. The institute is now the biggest within the republic Academy of Sciences. It studies both purely nuclear problems such as nuclear materials technology and nuclear power engineering, as well as radiation monitoring and nuclear ecology including provision of services to affected areas, and other spheres of applied science.

[A.K. Zhetbayev, Nuclear Physics Institute director] Many very important radioactive preparations were not being produced in our country. Thallium-201, for example. We were the first to produce thallium in the Union.

[Kondrashov] Thallium-201 is an indispensable preparation used in the early diagnosis of heart disease. Requests for supplies have come from a number of polyclinics in Tomsk, Tyumen, Yekaterinburg, Moscow, and St. Petersburg. There is also interest abroad.

AIDS has made it necessary to perfect sterilization of medical materials and instruments. In the civilized world gamma-rays have long been used for sterilization purposes. In our country the Alma-Ata Nuclear Physics Institute was the first to finally master this method. It makes it possible to sterilize artificial heart valves, catheters, blood transfusion instruments—in short anything that cannot be subjected to high temperatures.

People here have also found another use for gamma rays. By irradiating seeds, agricultural crop resistance and yields have been increased by 20 percent, and germination periods are being regulated. Irradiating the crops themselves can extend their storage life.

However, owing to the post-Chernobyl anti-nuclear mood the public's attitude toward nuclear science is one of intolerance, despite the fact that its fruits are all around us. For example, we are all familiar with ceiling-mounted fire alarms. Yet these are alpha-ray sources in which radium and plutonium is used. Someone has worked out that if all the fire alarms in Moscow were put in a heap the radiation danger would equal that of a bomb. Individually, the indicators are merely useful. Thus our fears are sometimes misplaced. Should a need nonetheless arise to monitor background radiation, the institute has developed a unique type of personal radiation meter which makes it possible simultaneously to monitor beta and gamma radiation. As such it has no parallel.

# **Turkmenistan Law on Stricter Penalties for Environmental Offenses**

92WN0318A Ashkhabad *TURKMENSKAYA ISKRA*  
in Russian 3 Dec 91 p 3

["Law of Turkmenistan on Stricter Penalties for Environmental Offenses"]

[Text] In order to establish stricter penalties for environmental offenses the Supreme Soviet of Turkmenistan hereby resolves:

I. to make the following amendments in and additions to the Criminal Code of Turkmenistan as approved by a TuSSR law of 22 December 1961 (see: VEDOMOSTI VERKHOVNOGO SOVETA TSSR, 1961, No 35, p 129; 1980, No 12, p 94; 1982, No 26, p 111, and No 36, p 156):

1. in the first part of Article 255, to replace the words "corrective labor for a period of up to one year or a fine of up to R300 [rubles]" with "imprisonment for a period of up to three years or corrective labor for a period of up to two years, or a fine of up to R5,000".

2. in article 255<sup>1</sup>:

—in the second paragraph of part one, to replace the words "up to one year or corrective labor for the same period of time" with "up to three years or corrective labor for a period of up to two years";

—in the second paragraph of part two, to replace the words "up to two years or corrective labor for the same period of time" with up to four years or corrective labor for a period of up to two years";

—in the second paragraph of part four, to replace the words "corrective labor for a period of up to one year or a fine of up to R500" with "imprisonment for a period of up to three years or corrective labor for a period of up to two years, or a fine of up to R5,000".

3. in the second paragraph of part one, Article 255<sup>5</sup>, to replace the words "up to R300" with the words "up to R5,000".

4. to add articles 255<sup>6</sup>, 255<sup>7</sup> and 255<sup>8</sup> to the code, with the following wording:

"Article 255<sup>6</sup>: Concealment or Distortion of Information Regarding Accidents Resulting in Adverse Environmental Effects

The concealment or distortion by responsible officials of information regarding accidents which could cause or have in fact caused harm to the public's health or to the environment, if administrative penalties have previously been imposed on the guilty parties for the same actions, are punishable by imprisonment for a period of up to four years or corrective labor for a period of up to two years, or by a fine of up to R5,000.

Article 255<sup>7</sup>: Concealment or Distortion of Information Regarding Levels of Environmental Pollution

Concealment or distortion by responsible officials of information regarding levels of environmental pollution which could cause or have in fact caused damage to the public's health or to the environment, if administrative penalties have previously been imposed on the guilty parties for the same actions, are punishable by imprisonment for a period of up to three years or corrective labor for a period of up to two years, or by a fine of up to R5,000.

Article 255<sup>8</sup>: Concealment of Information Regarding the State of Public Health

Concealment or distortion by responsible officials of information regarding the state of public health, if the damages to health in question were caused by an unsatisfactory state of the environment resulting from pollution and other effects on the environment, if administrative penalties have previously been imposed on the guilty parties for the same actions, are punishable by imprisonment for a period of up to five years or corrective labor for a period of up to two years, or by a fine ranging from R3,000 to R5,000."

II. to replace the numbers "253-255<sup>1</sup>" with the numbers "253-255<sup>8</sup>" in the fourth part of Article 138 of the Criminal Code of Turkmenistan as approved by a TuSSR law of 22 December 1961 (see: VEDOMOSTI VERKHOVNOGO SOVETA TSSR, 1961, No 35, p [number illegible]; 1977, No 8, p 51; 1976, No 10, p 51; 1982, No 11, p 39; 1983, No 29, p 79; 1984, No 3, p 14; 1985, No 5, p 13 and No 35, p 176; 1986, No 17, p 78; 1987, No 23, p 118, No 30, p 141 and No 35, p 173; 1988, No 14, p 78; 1989, No 7, p 34, No 8, p 35 and No 15, p 75).

III. to make the following amendments in and additions to the Turkmenistan Code of Administrative Offenses as approved by the Supreme Soviet of Turkmenistan on 17 December 1984 (see: VEDOMOSTI VERKHOVNOGO SOVETA TSSR, 1984, No 35, p 153; 1985, No 23, p 15 and No 35, p 175; 1986, No 14, p 58 and No 17, p 78; 1987, No 12, p 54, No 21, p 112, No 23, p 118, No 23, p 119 and No 26, p 129; 1989, No 12, p 58 and No 15, p 74):

1. in the title of Chapter 7 to add the word "natural" before the word "landmarks."

2. to amend articles 52, 53, 54 and 56 to read as follows:

"Article 52: Improper Land Use

Improper use of land, failure to take essential measures to improve land and protect soils against wind and water erosion and other processes which worsen the condition of soils, failure to comply with terms governing the removal and storage of the fertile soil layer, recultivation of land, or use of parcels of land for purposes other than



those for which they were allotted will result in the levying of a fine on private citizens of up to R100, and on officials up to R300.

**Article 53: Degradation of Agricultural Land and Other Land**

Degradation or destruction of the fertile soil layer or pollution of land with chemical or radioactive substances, bacteria, parasites or quarantined animals and plants, production-related and household wastes or waste water will result in imposition of a fine of up to R100 on private citizens and up to R300 on officials.

**Article 54: Failure to Comply With the Requirements of Environmental Protection Regulations Governing Land Use or Violation of Conditions for the Return of Temporarily Occupied Land**

Failure to comply with the requirements of environmental protection regulations governing land use, violations of conditions for the return of temporarily occupied land or failure to perform obligations with regard to restoration of land to a state appropriate for use according to its original purpose will result in imposition of a fine of up to R100 on private citizens and up to R300 on officials."

**"Article 56: Destruction of Survey Markers**

Destruction of survey markers demarcating the boundaries of land ownership or land use will result in a fine of up to R50 for private citizens and up to R100 for officials."

3. to add to the code articles 54<sup>1</sup>, 55<sup>1</sup>, 69<sup>1</sup>, 85<sup>1</sup>, 88<sup>1</sup> and 88<sup>2</sup> with the following wording:

**"Article 54<sup>1</sup>: Start-Up of Facilities Which Negatively Affect the Condition of Land**

Start-up of facilities which negatively affect the condition of the land will result in imposition of a fine of up to R500."

**"Article 55<sup>1</sup>: Distortion of Information Provided in Connection with State Land Registration, Record Keeping or Assessment**

Distortion of information provided in connection with state land registration, record keeping or assessment will result in imposition of a fine of up to R300 on officials."

**"Article 69<sup>1</sup>: Damages to Natural Pastureland**

Violation of regulations governing the pasturing of livestock which result in damages to natural pastureland in areas belonging to kolkhozes, sovkhozes and other agricultural enterprises, or on reserve lands, will result in imposition of a fine on private citizens of up to R300, and on officials up to R1,000.

Damages caused to grasses and shrubs on pastureland by motor vehicles, tractors and other machinery will result

in imposition of a fine of up to R300 on private citizens and up to R1,000 on officials.

Destruction of or substantial damages to pastureland through burning or as a result of violation of fire safety regulations will result in imposition of a fine of up to R3,000 on private citizens and up to R5,000 on officials."

**"Article 85<sup>1</sup>: Concealment or Distortion of Information Regarding Environmental Pollution**

Concealment or distortion of information regarding accidents with adverse environmental effects or levels of environmental pollution which could cause or which have in fact caused damage to public health or the environment, or information regarding the state of health of persons subjected to a harmful effect of pollution will result in imposition of a fine of up to R1,000 on officials."

**"Article 88<sup>1</sup>: Violation of Regulations Governing the Capture, Housing, Breeding, Use, Import or Export of Animals and Animal Products**

Violation of regulations governing the capture, housing, breeding, use, sale, acquisition, import into or export out of the republic or release into the wild of animals, reptiles or insects, including those raised in captivity, as well as the products thereof, will result in imposition of a fine on private citizens of up to R1,000, and on officials of between R1,000 and R10,000, plus confiscation of the animals and animal products in question.

Violation of regulations governing the breeding, housing, sale or acquisition of horses of the Akhalteka breed and local dog breeds will result in imposition of a fine of up to R1,000 on private citizens and between R1,000 and R10,000 on officials."

**"Article 88<sup>2</sup>: Destruction, Degradation and Damages Within Specially Protected Sites and Areas**

Intentional destruction, degradation or substantial damages within specially protected natural sites and areas—the natural complexes of state preserves, reserves, national parks and nature parks, health resort and sanatorium zones, typical or rare landscapes or natural landmarks—which have been taken under state protection will result in imposition of a fine on private citizens of up to R100 and on officials of up to R1,000."

4. to replace the words "on officials up to R50" in Article 55 with the words "on officials a fine of up to R100."

5. in Article 57:

—to replace the words "on private citizens in an amount of up to R50 and on officials in an amount of up to R100" in the part one with the words "on private citizens in an amount of up to R100 and on officials in an amount of up to R300"; in part two and three to

replace the words "on officials in an amount of up to R100" with the words "on officials in an amount of up to R300".

6. in articles 58 and 60, to replace the words "on officials in an amount of up to R100" with the words "on officials in an amount of up to R300".

7. in Article 59:

—in part one, to replace the words "on private citizens in an amount of up to R50 and on officials in an amount of up to R100" with the words "on private citizens in an amount of up to R100 and on officials in an amount of up to R300";

—in part two, to replace the words "on officials in an amount of up to R100" with the words "on officials in an amount of up to R300".

8. in Article 61:

—in part one, to replace the words "on private citizens in an amount of up to R50 and on officials up to R100" with the words "on private citizens in an amount of up to R100 and on officials up to R300";

—in part two, to replace the words "on officials in an amount up to R100" with the words "on officials in an amount of up to R300".

9. in article 62, to replace the words "will result in imposition of a fine of up to R100" with the words "will result in imposition of a fine of up to R300".

10. in articles 63, 64, 65 and 66, to replace the words "on private citizens in an amount of up to R50 and on officials up to R100" with the words "on private citizens in an amount of up to R100 and on officials up to R500".

11. in article 66<sup>1</sup>, to replace the words "on private citizens in an amount of up to R50 and a warning or fine for officials up to R100" with the words "on private citizens in an amount of up to R100 and a warning or fine for officials of up to R500".

12. in articles 67, 69, 70 and 73-76, to replace the words "on private citizens in an amount of up to R10 and on officials up to R50" with the words "on private citizens in an amount of up to R50 and on officials up to R500".

13. in articles 68 and 72, to replace the words "on officials in an amount of up to R100" with the words "on officials in an amount of up to R500".

14. in Article 71, to replace the words "on officials in an amount of up to R50" with the words "on officials in an amount of up to R500".

15. in Article 77:

—in part one, to replace the words "on private citizens in an amount of up to R10 and on officials up to R50"

with the words "on private citizens in an amount of up to R50 and on officials up to R200";

—in part two, to replace the words "on private citizens in an amount of up to R50 and on officials up to R100" with the words "on private citizens in an amount of up to R100 and on officials up to R500".

16. in articles 78, 79, 80 and 81, to replace the words "on officials in an amount of up to R100" with the words "on officials in an amount of up to R500".

17. in Article 82, to replace the words "in an amount of up to R30" with the words "in an amount of up to R60".

18. in article 83 and 84, to replace the words "on private citizens in an amount of up to R50 or to impose on officials a fine of up to R100" with the words "on private citizens in an amount of up to R100, with a warning or imposition of a fine on officials up to R500".

19. in Article 85, to replace the words "on private citizens in an amount up to R30, with a warning or imposition of a fine on officials up to R50" with the words "on private citizens in an amount of up to R60, with a warning or imposition of a fine on officials up to R300".

20. in articles 86 and 87, to replace the words "will result in imposition of a fine on private citizens in an amount of up to R50 and a warning or imposition of a fine on officials up to R100" with the words "will result in imposition of a fine on private citizens in an amount of up to R100 and on officials up to R1,000".

21. in articles 87<sup>1</sup> and 87<sup>2</sup>, to replace the words "on private citizens in an amount of up to R50 and on officials up to R100" with the words "on private citizens in an amount of up to R2,000 and on officials up to R3,000".

22. In Article 88:

—in part one, to replace the words "will result in a warning or imposition of a fine on private citizens of up to R50 and a warning or imposition of a fine on officials of up to R100" with the words "will result in imposition of a fine on private citizens in an amount of up to R2,000 and on officials of up to R3,000";

—in part two, to replace the words "on private citizens in an amount of up to R50 and on officials up to R100" with the words "on private citizens in an amount of up to R2,000 and on officials up to R3,000".

23. in part one of Article 211, to replace the words "Article 86" with the words "articles 85<sup>1</sup> and 86", and the words "Article 89" with the words "articles 88<sup>1</sup>, 88<sup>2</sup> and 89".

24. To edit the first point in part two, Article 224, to read as follows:

"1. for violations of legislation regarding underground resources, including regulations governing the protection and use of hydrominerological resources, the heads of rayon (or oblast) and sector-based inspection groups under the State Committee for Oversight of Work Safety in Industry and Mining will be fined in an amount of up to R100. The chairman of the Turkmenistan State Committee for Oversight of Work Safety in Industry and Mining (Goskomtekhnadzor Turkmenistana) and his deputies will be fined in an amount of up to R300".

25. in Article 228:

—to edit point one, part two, to read as follows:

"1. for violation of public sanitation and anti-epidemic regulations, standards and guidelines, the chief public health physician of Turkmenistan and his deputies, chief state public health physicians in each of the republic's administrative regions and their deputies, and chief state public health physicians for air and water transport will be fined, if private citizens, an amount up to R100, and if officials, up to R500";

—to delete point two.

26. in part three, Article 231:

—in the second paragraph, to replace the words "on private citizens a fine in an amount of up to R50 and on officials up to R100" with the words "on private citizens a fine in an amount up to R100 and on officials up to R300";

—in the third paragraph, to replace the words "on private citizens in an amount of up to R30 and on officials up to R50" with the words "on private citizens in an amount of up to R60 and on officials up to R100";

—in the fourth paragraph, to replace the words "on private citizens a fine in an amount of up to R10 and on officials up to R30" with the words "on private citizens a fine in an amount of up to R20 and on officials up to R60".

27. in part two, Article 233:

—in the second paragraph, to replace the words "on private citizens a fine in an amount of up to R50 and on officials up to R100" with the words "on private citizens a fine in an amount of up to R100 and on officials up to R300";

—in the third paragraph, to replace the words "on private citizens a fine in an amount of up to R40 and on officials up to R90" with the words "on private citizens a fine in an amount of up to R80 and on officials up to R200";

—in the fourth paragraph, to replace the words "on private citizens a fine in an amount of up to R30 and on officials up to R80; fines in an amount of up to R10" with the words "on private citizens a fine in an amount of up to R60 and on officials up to R200; fines in an amount of up to R20".

28. in part one, Article 246<sup>1</sup>:

1. in point 1:

—in the second paragraph, to delete the words "on offenses connected with levels in excess of standards levels for noise created by the operation of means of transportation"; to add the number "88<sup>1</sup>, 88<sup>2</sup>" before the number "89" in the same paragraph;

—in the third paragraph, to add the number "54<sup>1</sup>", 55<sup>1</sup> before the number "49<sup>1</sup>", and to replace the words "articles 86-87<sup>2</sup>" with the words "articles 85<sup>1</sup>-87<sup>2</sup>", and to add the number "88<sup>1</sup>, 88<sup>2</sup>" before the number "98";

—in the fifth paragraph, to add the words "Article 88<sup>1</sup>";

—in the sixth paragraph, to add the words "articles 88<sup>1</sup>, 88<sup>2</sup>";

—in the seventh paragraph, to add the number "88<sup>1</sup>" after the word "article";

—in the eleventh paragraph, to add the numbers "88<sup>1</sup>, 88<sup>2</sup>" after the number "159<sup>1</sup>".

2. in point 8:

—in the fourth paragraph, to add the number "88<sup>1</sup>, 88<sup>2</sup>" before the number "105";

—in the fifth paragraph, to add the number "88<sup>1</sup>" before the number "201";

—in the sixth paragraph, to add the words "Article 88<sup>1</sup>";

—in the seventh paragraph, to add the number "88<sup>1</sup>" before the number "201";

IV. that within a period of two months the Government of Turkmenistan shall:

—bring current governmental standardizing acts into accordance with the present law;

—ensure that the ministries, state committees and agencies of Turkmenistan adopt new standardizing acts and review and if necessary repeal existing ones, including regulations and guidelines which are in violation of the present law.

[Signed] S. Niyazov, President of Turkmenistan  
Ashkhabad, 12 November 1991

#### **Turkmenistan Issues Law on Environmental Protection**

92WN0317A Ashkhabad TURKMENSKAYA ISKRA  
in Russian 5 Dec 91 pp 2-3

[Law of Turkmenistan on the Protection of Nature"]

[Text] Protection of nature, rational use and renewal of its resources and restoration of Turkmenistan's natural

environment are national goals of the state, a cause of all the people and the moral duty of every citizen of Turkmenistan.

The state policy of Turkmenistan in the field of environmental protection is aimed at ensuring the priority of society's ecological interests together with a scientifically-based concept combining development of commercial and other activities with a thoughtful attitude toward nature and its riches, rational use of natural resources and guarantees for the rights of human beings to a healthy and viable environment. The state sees the need for broad and effective international cooperation to preserve natural resources and establish general and complete environmental safety throughout the entire world community.

Environmental protection legislation combined with measures of an organizational, economic and educational nature is intended to help establish and strengthen an environmentally-oriented system of law which will protect the environment and citizens' life and health.

### **I. General Principles**

#### **Article 1: Basic Environmental Protection Principles**

When engaging in commercial, administrative or other activities which affect the state of the environment, soviets of people's deputies, their executive and administrative organs, corporate bodies and individual citizens have an obligation to be guided by the following principles:

- preservation of the viability of the biosphere and its ecological systems as a sphere of human existence;
- a scientifically-based combination of society's environmental, economic and social interests;
- guarantees of citizens' rights to a viable environment;
- guarantees of openness with regard to the performance of environmental tasks and close contacts with public organizations and the general public;
- a combination of national, interstate and international interests in the field of environmental protection;
- compliance with the requirements of environmental legislation and prosecution of violators thereof.

#### **Article 2: Components of the Environment Subject to Protection**

Soils, underground resources, water, forests, flora and fauna in all their diversity, the atmosphere, components of natural ecological systems and the biosphere and the Earth's climate and ozone layer are all subject to protection from pollution, degradation, damages, depletion, destruction, extinction or any other irrational use.

#### **Article 3: The Environmental Protection Legislation of Turkmenistan**

Relations within the area of environmental protection in Turkmenistan are regulated by the Constitution of Turkmenistan, the present law, other environmental protection legislation adopted in accordance with the Constitution and the present law, and legislation governing the use of land, water and timber resources, underground resources, the atmosphere and animal and plant life, and other specialized laws of Turkmenistan.

#### **Article 4: The Authority of Village, Town, Rayon and City Soviets of People's Deputies In the Area of Environmental Protection Regulation**

The following are under the jurisdiction of village, town, rayon and city soviets of people's deputies with regard to environmental protection regulation within their respective territories:

- the organization, planning and financing of environmental protection efforts;
- coordination of environmental protection efforts by administrative organs and corporate bodies;
- arrangements to voluntarily pool funds on a cooperative basis to carry out environmental protection measures;
- monitoring of environmental protection and adoption of decisions (within the limits of their authority) declaring 10-day suspensions of commercial activities which have a harmful effect on the environment;
- participation in the establishment of nature preserves;
- promotional work for environmental protection and ecological training and education;
- regulation of other environmental protection matters which fall within their jurisdiction.

#### **Article 5: The Authority of Oblast Soviets of People's Deputies With Regard to Environmental Protection Regulation**

The following are under the jurisdiction of oblast soviets of people's deputies with regard to environmental protection regulation within their respective territories:

- definition of basic directions for environmental protection and approval of environmental programs;
- recording and assessment of the state of natural resources and environmentally harmful facilities, and maintenance of cadastral documentation on the environment and resources;
- planning for environmental protection, and financing and material-technical supply for environmental protection plans;
- conducting of public environmental assessments;

- monitoring of environmental protection, and adoption (within the limits of their authority) of decisions to declare 10-day suspensions of commercial activity which adversely affects the environment;
- monitoring of the use of oblast state and public environmental protection funds;
- promotional work for environmental protection and ecological indoctrination and education;
- regulation of other environmental protection matters falling within their jurisdiction.

**Article 6: The Authority of Turkmenistan With Regard to Environmental Protection Regulation**

The following are under the jurisdiction of Turkmenistan with regard to environmental protection regulation:

- development and passage of legislative acts in the area of environmental protection;
- establishment of environmental safety standards within the territory of Turkmenistan; establishment of limits on and standards for natural resource utilization;
- establishment of a state environmental protection fund;
- planning and financing of environmental protection measures and approval of state environmental programs, including regulations governing specially protected natural regions;
- accounting for and assessment of natural resources, and maintenance of cadastral maps of natural resources according to a procedure established by law;
- coordination of environmental protection efforts by corporate bodies, regardless of their subordination;
- establishment of a procedure for and limits on payment for the use of natural resources, for environmental pollution and for other types of adverse effects on the environment;
- development and approval of standards for maximum permissible concentrations of harmful substances in the environment;
- organization of a unified environmental protection service, provision of state environmental assessments, and monitoring of environmental protection measures;
- decision making in regard to the suspension or termination of operations or reorientation of ecologically harmful facilities, regardless of their form of ownership;
- organization of efforts to promote environmental protection and carry out public environmental education and training;

- implementation of interstate and international cooperation in the area of environmental protection;
- regulation of other environmental protection matters.

**II. Economic Measures in Support of Environmental Protection**

**Article 7: The Economic Mechanism for Support of Environmental Protection**

The economic mechanism of environmental protection operates in the form of:

- levying of fees for the use of natural resources, for environmental pollution (including waste storage) and for other types of adverse effects on the environment;
- tax breaks, credits and other benefits granted to corporate bodies and individual citizens who help introduce no-waste, low-waste or resource-conserving technologies and types of production or who engage in other activities which yield a environmentally protective and restorative effect;
- introduction of a special tax system for enterprises, institutions and organizations which use environmentally hazardous technologies and engage in other activities harmful to the environment;
- buying and selling of licenses (permits) granting the right to emit (discharge) pollutants into the environment or to engage in other environmentally negative activities, with consideration for the ecological carrying capacity of the region in question and environmental protection requirements;
- requirement of corporate bodies and individual citizens to restore environments disrupted by them or individual parts thereof;
- imposition according to established procedure of cash compensation for damages incurred as a result of degradation or destruction of natural sites;
- full or partial deprivation of officials and other employees of bonuses given to them based on the results of their primary production activity, in the event that they fail to comply with environmental protection plans and measures or violate technical standards and other legal requirements in the area of environmental protection;
- material incentives to the collectives and employees of corporate bodies and to individual citizens who achieve the best environmental protection results.

The legislation of Turkmenistan and decisions by local soviets of people's deputies made within the limits of their authority may establish other types of economic incentives for environmental protection efforts.

Application of economic incentives for environmental protection efforts is to be carried out according to a procedure set forth in the legislation of Turkmenistan



and in decisions made by local soviets of people's deputies within the limits of their authority.

#### **Article 8: Planning of Environmental Protection Measures**

The goal of planning for environmental protection measures is to ensure harmonious interaction between nature and society on the basis of a scientifically-based combination of ecological, economic and social interests, selection of the most effective means of rational natural resource utilization, prevention and elimination of negative effects from commercial and other activities on the environment, and preservation of and increase in the natural resource potential of Turkmenistan and its individual regions.

Current and long-range planning for environmental protection measures must be carried out in accordance with state plans for the economic and social development of Turkmenistan, taking into consideration state and other programs and general strategies for the development and siting of production facilities and sectors of the economy.

Regional planning for environmental protection measures should be carried out by the appropriate soviets of people's deputies, with participation by state and public environmental protection organs.

Sector-based planning in the area of environmental protection should be carried out by ministries, agencies and other commercial organs, with consideration for regional planning indices and in consultation with organs of the Turkmenistan State Committee for Protection of the Environment.

#### **Article 9: Financing of Environmental Protection Measures**

Financing of environmental protection measures is to be carried out using:

- funds from state-owned, public and other enterprises, institutions and organizations, voluntary public contributions and other sources;
- city, rayon, oblast and state environmental protection funds;
- local and state budgets;
- bank loans.

Financing of environmental protection measures should be listed as a separate item in local and state budgets.

#### **Article 10: State and Public Environmental Protection Funds**

Oblast and state environmental protection funds are to be established to finance environmental protection measures, renew natural resources, restore lost natural resources, eliminate the environmental effects of accidents and disasters and compensate for the damages

caused, and also to cover unforeseen expenditures for these purposes. The procedure for establishment and utilization of those funds is defined by the laws of Turkmenistan.

Public environmental protection funds are to be formed using voluntary contributions from the public, corporate bodies and other sources. The procedure for establishing and utilizing such funds is to be determined by a statute approved by the appropriate public organization.

### **III. Technical Standards and Meteorological Support for Environmental Protection**

#### **Article 11: Requirements of Technical Standards and Meteorological Support for Environmental Protection**

A unified system of requirements governing technical standards and meteorological support for environmental protection and regulating the effect of production activities and other activities on the environment is to be established in order to protect the environment.

The system of technical standards and meteorological support includes standards for maximum permissible concentrations in and emissions of pollutants and micro-organisms into the environment, application of harmful physical effects on it, and radiation safety levels.

This system includes state, local and sector-based requirements, as well as requirements established by enterprises.

Requirements for technical standards and meteorological work in the field of environmental protection should concur with international conventions and agreements to which Turkmenistan is a party, and with standards and the latest world scientific advances in the technology of the environmental protection field.

Development of technical standards and meteorological requirements in the area of environmental protection is to be carried out according to a procedure established by law.

#### **Article 12: Compliance With Technical Standards and Meteorological Requirements Pertaining to Environmental Protection**

In connection with non-compliance with technical standards and meteorological requirements relative to environmental protection, emission or discharge of pollutants or other types of adverse effects on the environment the operations of enterprises, institutions and organizations, separate subunits thereof, facilities and equipment may be restricted, suspended or banned, up to and including complete termination of operations, by decision of state environmental protection organs, public health organs, industrial safety organs, organs for the oversight of mine safety and other specially authorized organs or by local soviets of people's deputies at their recommendation, with simultaneous withdrawal of financing for banned operations until such time as the violations are eliminated.

#### IV. State Environmental Assessment

##### Article 13: The Purposes of State Environmental Assessment

The purposes of state environmental assessment are:

- to determine the level of environmental safety for planned or current commercial or other activities which might presently or in the future either directly or indirectly have a negative effect on the state of the environment or on public health;
- to assess the appropriateness of planned or projected commercial or other activities from the standpoint of environmental protection legislation;
- to determine the adequacy and validity of planned environmental protection measures.

State environmental assessment is to be carried out by state environmental protection organs based on the principles of adherence to law, scientific validity, comprehensiveness and openness, and with participation by state and public organizations if necessary.

Experts from other states and international organizations may be invited to take part in the conducting of a state environmental assessment.

##### Article 14: Subjects of State Environmental Assessment

The following are subject to state environmental assessment:

- drafts of state plans, programs, concepts and the basic orientations and siting diagrams for production facilities and economic sectors;
- pre-planning, pre-project and project documentation on the development of commercial and other activities, realization of which could have a negative effect on the state of the environment;
- drafts of instructional, methodological and technical standardization documents regulating commercial activity;
- documentation on the creation of new equipment, technologies, materials and substances, including those purchased abroad, and other documentation and equipment;
- products imported into or exported out of Turkmenistan;
- the environmental situation in Turkmenistan and its regions;
- operational enterprises and other facilities which have a negative effect on the state of the environment.

##### Article 15: Findings of a State Environmental Assessment

The findings of a state environmental assessment should be considered by the organ which is making the management decision in question.

Realization of a project subject to environmental assessment without a positive environmental assessment finding is forbidden and may not be financed.

State environmental assessments are to be carried out in accordance with a procedure set forth in the legislation of Turkmenistan.

#### V. Ecological Requirements for Commercial and Other Activities

##### Article 16: Ecological Requirements With Regard to the Siting, Planning, Construction, Rebuilding, Start-up, Use and Liquidation of Enterprises, Facilities and Other Sites

Environmental safety requirements must be complied with and provision made for environmental protection measures when enterprises, facilities and other sites are sited, planned, built, rebuilt, expanded or refitted, as well as when they are started up, operated or liquidated.

Plans for commercial and other activities should contain documents assessing environmental impact drawn up by the project contractor and including analysis, summarization and dissemination of information on that impact and essential environmental protection measures.

This assessment must be conducted with consideration for the ecological carrying capacity of the region, the state of the environment at the place planned as the site of the facility, prospects for social and economic development of the region, volumes and types of the facility's effect on the environment, and the requirements of Turkmenistan's environmental protection legislation.

An environmental impact assessment must be conducted according to a procedure set forth in the legislation of Turkmenistan.

It is forbidden to put into operation sites which are not fully in compliance with all environmental requirements, or without completion of planned environmental protection work.

Violation of environmental requirements will result in liability as set forth in Article 12 of the present law.

##### Article 17: Ecological Requirements Governing the Handling of Radioactive and Chemical Substances

Corporate bodies and individual citizens are obligated to comply with environmental requirements during the production, storage, transport, use, neutralization or burial of radioactive and chemical substances, to comply with established standards for their use, to take measures to prevent and eliminate the harmful effects on the environment from their use, and also to immediately

report incidences of standards being exceeded to organs which oversee radioactive and chemical safety.

It is forbidden to import radioactive and chemical wastes into Turkmenistan for the purpose of storage or burial there.

Violations of environmental requirements governing the handling of radioactive and chemical substances which present a threat of environmental pollution will result in a ban on the production, storage, transportation, use, neutralization or burial of those substances by a decision of a state organ for industrial safety oversight and mine safety, an environmental protection organ or another specially authorized organ.

#### **Article 18: Protection of the Environment from Adverse Biological Effects**

Corporate bodies which cause or can cause biological effects on the environment are obligated to ensure environmentally safe production, creation, storage (containment), acclimatization and re-acclimatization, transport, use and burial of biological types of microorganisms, animals, plants and substances, develop and carry out measures to prevent accidents and disasters and to warn of and eliminate the effects of harmful biological effects on the environment and human health and on preservation of the genetic pool and ecological systems.

#### **Article 19: Protection of the Environment From the Influence of Noise, Vibration, Electromagnetic Fields and Other Adverse Physical Effects**

Local soviets of people's deputies, corporate bodies and citizens are obligated to take necessary measures to warn of and eliminate harmful production-related noise, vibration and electromagnetic fields and other adverse physical effects on the environment and on human beings in population centers, suburban public recreation areas, sites of mass gatherings and wildlife breeding grounds.

It is forbidden to violate standards for maximum permissible levels of effect on human health and the environment by production- and transport-related noise, vibration, electromagnetic fields and other adverse physical effects.

#### **Article 20: Protection of the Environment from Pollution by Industrial, Household and Other Wastes**

Corporate bodies and citizens are obligated to take effective measures to curtail the creation of and to neutralize, process, utilize, store or bury wastes from production and consumption.

Sites for the storage or burial of wastes are to be selected by decision of local soviets of people's deputies in consultation with state organs for environmental protection, sanitary oversight, geology and safety oversight in industry and mining, as well as other interested state organizations. It is forbidden to discharge wastes and untreated waste water into publicly-used bodies of water,

underground aquifers or within housing developments, forests and agricultural land.

Neutralization of hazardous wastes at special facilities and the burial or storage of wastes at waste disposal sites are to be carried out with the permission of state environmental protection organs and in consultation with sanitary oversight organs and other interested state organs. It is forbidden to bury hazardous wastes, including highly radioactive wastes, within any area near cities and other population centers, in regions with a high population density, in bodies of water, including internal maritime and territorial waters, in zones used for health resorts, medical facilities or recreation, and in other places where the wastes could present a threat to the environment or to human health.

Permits to bury radioactive wastes are to be issued by specially authorized organs according to a procedure set forth by the Government of Turkmenistan.

Failure to comply with the requirements established by the present article will result in restriction, suspension or termination of operations by enterprises and other facilities connected with the creation of wastes; this may be done by decision of state environmental protection organs, state sanitary oversight organs, state organs for the supervision of industrial and mine safety or local soviets of people's deputies, within the bounds of their authority.

### **VI: Specially Protected Natural Areas and Sites**

#### **Article 21: Natural Areas and Sites Subject to Special Protection**

Specially protected areas and sites include state preserves, national historical and national natural park and memorial parks, reserves, natural (geological) landmarks, botanical and zoological gardens, arboretums, and plants and animals listed in the Red Book of Turkmenistan. The laws of Turkmenistan and decisions by local soviets of people's deputies may also make provision for other categories of specially protected natural areas and sites.

Declaration of areas state preserves, establishment of or changes in the boundaries thereof, the procedure for establishment of other specially protected territories and the maintenance of the Red Book of Turkmenistan are the functions of the Government of Turkmenistan.

Health resort and recreational zones, coastal strips and water protection zones (strips) around bodies of water, protected fishing zones and off-limits areas of forests and other zones are subject to special protection in accordance with a procedure established by the laws of Turkmenistan.

#### **Article 22: Protection of Climate and the Earth's Ozone Layer**

Protection of climate and the Earth's ozone layer from environmentally hazardous changes is ensured by:

- organization of a portion of the global network for the observation, recording and monitoring of the state of climate and the ozone layer under the influence of commercial activity and other processes;
- establishment of and compliance with standards for maximum permissible emissions of hazardous substances which effect the state of climate and the Earth's ozone layer;
- reduction in and complete elimination of planning relative to the production and use in the economy and in the home of chemical substances which destroy the ozone layer;
- imposition of penalties for violation of these requirements.

## VII: Emergency Environmental Situations

### Article 23: Environmental Emergency and Environmental Disaster Zones

Environmental emergency zones are areas of land, water or airspace where as a result of commercial or other activities, the destructive forces of nature or an accident or disaster there have occurred persistent negative changes in the environment which threaten human health, the state of natural ecological systems or the genetic pool of plants and animals.

Environmental disaster zones are areas of land, water or airspace where as a result of commercial or other activity, the destructive forces of nature or an accident or disaster there have occurred persistent and irreversible changes in the environment resulting in disruption of the natural balance, destruction of natural ecological systems and degradation of soils and plant and animal life.

Declaration of environmental emergency and environmental disaster zones and establishment of regulations governing them are the functions of Turkmenistan's legislative acts.

The financing of recovery measures in connection with environmental emergencies and environmental disasters and restoration of environmental emergency and disaster zones is to come from the funds of the enterprises or institutions responsible for the accident or disaster, and also from special-purpose funds in the local and state budgets and environmental protection funds.

## VIII: Monitoring in the Area of Environmental Protection

### Article 24: Purposes of State Monitoring in the Area of Environmental Protection

The purposes of state monitoring in the area of environmental protection are to ensure compliance by all corporate bodies and citizens with the environmental protection requirements set forth in the legislation of Turkmenistan.

### Article 25: Organs Which Monitor Environmental Protection

State monitoring in the area of environmental protection is to be conducted by local soviets of people's deputies and specially authorized state organs.

One specially authorized super-departmental environmental protection organ is the Turkmenistan State Committee for Environmental Protection, which coordinates efforts to ensure rational natural resource utilization, environmental protection and renewal and protection of natural resources and implements a unified scientific and technical policy in the area of the environment.

The activities of state environmental protection organs are to be regulated by statutes approved according to proper legislative procedure.

The environmental services of ministries, state committees and other agencies conduct departmental monitoring in the area of environmental protection with regard to the activities of the enterprises and organizations subordinate to them.

Procedure governing the organization and activities of a departmental environmental service is regulated by statutes approved in consultation with organs of the Turkmenistan State Committee for Environmental Protection, ministries, state committees and other agencies on the basis of the present law.

In-house monitoring in the area of environmental protection is to be conducted by the environmental services of enterprises, institutions and organizations and has the purpose of verifying compliance with plans and measures connected with environmental protection, rational use and renewal of natural resources, restoration of the environment and compliance with environmental quality standards.

Procedure for the organization and activities of an in-house environmental services is regulated by statutes approved in consultation with organs of the Turkmenistan State Committee for Environmental Protection, enterprises, associations and organizations on the basis of the present law.

Public monitoring in the area of environmental protection is to be conducted by public organizations, labor collectives and the public.

Procedure for the conducting of public environmental monitoring is regulated by the present law, legislation on labor collectives and public organizations and the charters (or statutes) of public organizations.

### Article 26: Environmental Monitoring

Environmental monitoring is a system of observations conducted with regard to the state of the environment and its individual components which is established in order to reveal changes therein in a timely manner,

assess those changes, issue warnings and overcome the effects of negative processes.

The structure and nature of and procedure for the conducting of this monitoring are to be established by the Government of Turkmenistan.

#### **IX: Citizens' Rights to a Livable Environment; Public Participation in Environmental Protection**

##### **Article 27: Citizens' Right to a Livable Environment**

Every citizen of Turkmenistan has a right to live in an environment which is favorable for his or her health and the health of future generations.

That right is ensured by:

- compliance with environmental requirements during the development and siting of production facilities, regional production complexes, industry, agriculture, energy production, transportation and other sectors of the economy, enterprises, installations and other facilities which have an effect on the environment;
- a procedure established by the laws of Turkmenistan in regard to compensation for damages caused to citizens by violations of their rights in the area of environmental protection, as well as other guarantees set forth in the present law and others of Turkmenistan's environmental protection acts.

Citizens' exercise of their rights to a livable environment should be combined with their performance of their own environmental protection duties and compliance with Turkmenistan's environmental protection legislation.

##### **Article 28: Citizens' Rights and Duties With Regard to Environmental Protection**

The citizens of Turkmenistan have a right:

- to environmental education and training;
- to participate in environmental protection and to multiply and preserve natural resources through their own efforts;
- to form public environmental protection associations;
- to participate in discussion of drafts of legislative and other acts submitted for public discussion, and to submit letters, complaints and petitions on environmental protection issues;
- to demand and receive timely and reliable information on the state of the environment and environmental protection measures;
- to participate in the making of decisions, implementation of which is intended to restore the health of the environment, as well as in the conducting of public environmental assessments;
- to propose repeal of decisions in connection with the siting, planning, construction, rebuilding or operation

of environmentally harmful facilities or the restriction, suspension or termination of activities through which corporate bodies which are exerting a negative influence on the environment or on human health;

- to file lawsuits against corporate bodies and individual citizens in pursuit of compensation for damages caused to their health or property as a result of negative effects on the environment.

The citizens of Turkmenistan are obligated to protect nature, to preserve its riches and to comply with the requirements of Turkmenistan's environmental protection legislation.

##### **Article 29: Forms of Participation by Turkmenistan's Citizens in Environmental Protection**

The citizens of Turkmenistan participate in environmental protection through personal participation (on a voluntary basis) in measures to prevent or eliminate violations of environmental protection legislation, voluntary payment of their earned savings into environmental protection funds, participation in environmental protection work done by labor collectives and public organizations, and assistance to the above in their efforts to protect the environment.

##### **Article 30: Powers of Public Environmental Protection Organizations**

Public environmental protection organizations and other public organizations and associations which perform environmental protection functions have a right:

- to draft, approve and promote their own environmental protection programs in the press and over radio and television, to protect the public's rights and interests in the area of environmental protection, to help increase the public's environmental awareness, and to recruit citizens on a voluntary basis to take part in active environmental protection efforts;
- to use their own funds and voluntary public participation to perform work intended to protect and renew natural resources, preserve and improve the environment; establish public environmental protection inspection groups; take part in programs of inspection carried out by state environmental protection organs with regard to compliance by corporate bodies with environmental protection plans and measures; demand that such inspections be carried out by specially authorized organs; establish public environmental protection funds and spend such monies on the conducting of environmental protection measures;
- to demand that state environmental assessments be conducted in regard to the siting, construction or use of facilities or that their activities be restricted, suspended or terminated (or reoriented), and to participate in the work of assessment groups;
- to demand that timely, complete and reliable information be made available regarding the state of the



environment, sources of environmental pollution, the main directions, programs and measures for environmental protection, and to receive information which is of interest to them;

—to file suit in courts of law or commercial courts seeking compensation for damages to the environment, health or the property of citizens and public organizations caused by violations of environmental protection legislation, including violations committed by state environmental protection organs.

Environmental protection activities by public organizations and other public formations must be carried out in accordance with the charters thereof and current legislation.

**Article 31: Guarantees for the Rights of Citizens and Public Organizations in the Area of Environmental Protection**

Turkmenistan guarantees citizens and public organizations engaged in environmental protection efforts the ability to exercise the rights granted to them in the area of environmental protection in accordance with current legislation.

Soviets of people's deputies, state environmental protection organs and other specially authorized organs are obligated to render all possible assistance to citizens and public environmental protection organizations with the exercise of their rights and performance of their duties in the area of environmental protection, to take necessary steps to consider proposals regarding the organization of environmental protection efforts, to ensure openness regarding and access to information on the state of the environment, all types of pollution and the findings of environmental assessments, and to inform the public promptly of environmentally hazardous accidents and situations.

Persons who hinder the exercise of rights and performance of duties stemming from the present law by citizens and public organizations or who intentionally distort or conceal information regarding the state of the environment are liable in accordance with the current legislation of Turkmenistan.

**X: Education and Training in the Area of Environmental Protection; Scientific Research**

**Article 32: Education and Training in the Area of Environmental Protection**

In order to raise the level of environmental awareness in society and improve the professional training of republic specialists universal, continuing and accessible education and training will be provided in the area of environmental protection, encompassing preschool and school education and training, professional training of specialists at secondary and higher educational institutions, and advanced training.

All secondary specialized and higher educational institutions must regardless of their orientation provide mandatory instruction in fundamental knowledge of and other courses relating to environmental protection.

The heads of ministries and agencies, enterprises, institutions and organizations and other officials and specialists connected with activities which affect the environment are required to have essential environmental protection knowledge.

Organs of public education and environmental protection, other state organs and public organizations and the mass media should disseminate information about environmental protection and publicize environmental protection legislation.

**Article 33: Scientific Research in the Area of Environmental Protection**

For the purpose of scientific study of the environment research is to be carried out on:

- the creation of progressive low-waste technological processes and modern technical means which will ensure environmental safety at industrial, transportation-related, agricultural and other enterprises, installation and facilities when they are in operation;
- ways of ensuring economically efficient, rational and resource-conserving use of natural resources;
- creation of means for continuous monitoring of the state of the environment, production management and the accident- and hazard-free operation of equipment;
- restoration of the essential qualities of the environment;
- definition of possible environmental qualities;
- definition of possible means of preventing or reducing harmful effects on the environment;
- development of tourism and excursions, and cooperation with foreign countries for the purpose of learning about advanced environmental protection methods.

**XI: Liability for Violation of Environmental Protection Legislation and Damages Caused by Violations of Environmental Protection Legislation; Resolution of Disputes Pertaining to Environmental Protection**

**Article 34: Liability for Violation of Environmental Protection Legislation**

Persons who are guilty of:

- violating standards, norms and other standard technical requirements regarding environmental protection;
- failure to comply with requirements imposed by a state environmental assessment;

- refusal to make established payments for the use of natural resources, environmental pollution or other types of harmful effects on the environment;
- intentional provision of false findings of state environmental assessments or false assessments of a facility's effect on the environment;
- violation of environmental requirements, including instances of exceeding the established environmental carrying capacity of a region, during the planning, design, siting, construction, rebuilding, start-up, use or liquidation of enterprises, installations, mobile equipment and other facilities or the export or import of environmentally harmful products;
- excessive pollution of the environment or excessive biological, physical or other effects on the environment;
- failure to take measures to restore the environment and renew natural resources;
- failure to comply with the instructions of organs which carry out state environmental protection;
- violations of requirements governing the storage, transport, use, neutralization or burial of wastes resulting from production or consumption;
- violation of environmental requirements governing the handling of radioactive and chemical substances;
- hindrance of visits to facilities by officials engaged in state environmental monitoring;
- refusal to provide timely, complete and reliable information regarding the state of the environment and use of natural sites, or regarding pollution sources; failure to report excessive pollutant emissions or other accidental harmful effects on the environment—bear administrative, criminal and other types of liability in accordance with the laws of Turkmenistan.

The laws of Turkmenistan may also establish liability for other violations of environmental protection legislation.

Liability for the legal violations listed in the present article does not preclude liability for violations of legislation on land, water and forests, legislation on underground resources or preservation of air quality, legislation protecting plant and animal life or other special legislation.

Prosecution does not exempt the guilty parties from the obligation to make restitution for damages caused as a result of actions which were in violation of environmental protection legislation.

#### **Article 35: Restriction, Suspension, Termination or Reorientation of Activities Which Exert a Harmful Influence on the Environment**

The activities of enterprises, organizations, installations and other facilities may be restricted or suspended, and

if it is impossible to eliminate the causes for those actions also terminated or reoriented, in the following cases:

- a harmful influence on the health and living conditions of human beings or on natural resources, specially protected areas and the environment;
- the threat of accidents which would have a harmful effect on the environment, or the occurrence of such;
- violations of technical and meteorological standards with regard to environmental protection;
- violation of environmental requirements governing the siting, planning, construction, rebuilding, start-up and use of enterprises, organizations, installations and other facilities;
- violation of environmental requirements governing the handling of radioactive, chemical or biological substances and microorganisms;
- violation of environmental requirements regarding protection of the environment from wastes produced as a result of production or consumption.

Decisions regarding restriction, suspension, termination or reorientation of activities by enterprises, organizations, installations or other facilities are to be made by soviet of people's deputies and state environmental protection organs within the bounds of their authority, with simultaneous termination of financing for the guilty corporate and physical persons.

#### **Article 36: Obligation to Make Compensation for Damages Caused by Violation of Environmental Protection Legislation**

Corporate bodies and citizens that cause damage to the environment by polluting it or having other harmful effects on its, or by committing other violations of environmental protection legislation, are required to make compensation for those damages in full in accordance with the laws of Turkmenistan.

#### **Article 37: Procedure for Compensation for Damages Caused by Violation of Environmental Protection Legislation**

Compensation for damages caused to the environment by a violation of environmental protection legislation is to be made either voluntarily or by order of a court or commercial court in accordance with established procedure governing rates and methodologies for calculating the amount of damages or, if such do not exist, on the basis of actual expenditures made to restore disruption in the state of the environment, with consideration also given to losses suffered.

**Article 38: Compensation for Damages Incurred by Citizens as a Result of Negative Effects on the Environment**

Damages incurred by citizens as a result of negative effects on the environment caused by the activities of corporate bodies or individual citizens are subject to compensation in full.

Compensation for damages is to be made on the basis of a court order in connection with a suit filed by the victim, members of his or her family, a procurator, specially authorized environmental protection organs or public organizations.

Compensation to citizens for damages incurred as a result of major accidents and disasters with environmental consequences are to be made in accordance with the laws of Turkmenistan.

**Article 39: Material Liability on the Part of Employees Responsible for Causing Damages Through Violation of Environmental Protection Legislation**

Officials and other citizens guilty of causing damages to the environment or to citizens' health or property bear material liability in accordance with the laws of Turkmenistan.

**Article 40: Requirement to Terminate Environmentally Harmful Activities on the Basis of Lawsuits**

Corporate bodies have a right to appeal to a court of law or a commercial court, and citizens have a right to appeal to a court of law, seeking termination of environmentally harmful activities which cause damage to the environment, to citizens' health or property, or to the property of corporate bodies.

The order of a court or a commercial court terminating environmentally harmful activities is to be carried out in accordance with the laws of Turkmenistan and constitutes grounds for termination of financing for the activities in question.

**Article 41: Procedure for Resolving Disputes in the Area of Environmental Protection**

Disputes in regard to environmental protection matters are to be resolved by local soviets of people's deputies, a court of law or a commercial court according to a procedure established by law.

Property disputes connected with violations of environmental protection legislation are to be resolved by a court of law or a commercial court within the bounds of their authority.

Disputes relative to environmental protection between state, public and other organizations in Turkmenistan or with state and public organizations in another state are to be heard by a commission formed on a parity basis from among representatives of the states involved.

**XII: International Treaties in the Area of Environmental Protection**

**Article 42: International Treaties in the Area of Environmental Protection**

If Turkmenistan's international treaties establish other regulations than those contained in Turkmenistan's environmental protection legislation, then the regulations contained in the international treaties apply, with the exception of cases in which more stringent requirements are in effect in Turkmenistan.

[Signed] S. Niyazov, President of Turkmenistan  
Ashkhabad, 12 November 1991

**Earthen Dam Built To Protect Caspian Sea To Be Removed**

*LD3003085192 Moscow Radio Moscow World Service in English 0700 GMT 30 Mar 92*

[Text] On the decision of President Saparmurat Niyazov of Turkmenistan, work is starting to remove the earthen dam that separates the Kara Bogaz Gol bay from the Caspian Sea. The dam was built 12 years ago to stop the flow of waters from the sea to the bay and in this way to raise the then lower level of the Caspian Sea. But, as the result of building the dam, the bay has practically become dry. From its bare floor millions of tons of salt have been blown away by winds, which has led to an ecological disaster in the area.

**Uzbek Water Resources Minister on Aral Basin Problems**

*92WN0358A Tashkent PRAVDA VOSTOKA in Russian 30 Aug 91 p 2*

[Interview with R.A. Giniyatullin, water resources minister of Uzbekistan, by R. Mukhametzyanov and I. Khisamov; place and date not given: "The Water Problem—A Problem of Survival"]

[Text] The demise of the Aral is a tragedy of hundreds of thousands of people, one of the greatest ecological catastrophes of modern times. But if we look the whole truth fearlessly in the eye, the drying up of this huge lake of a sea is only a symptom of the most severe water crisis advancing upon the entire Central Asian region. And the water shortage problem is literally becoming a problem of the survival of the peoples inhabiting the Aral basin, believes Uzbekistan Water Resources Minister R.A. Giniyatullin. Our correspondents interview him.

[PRAVDA VOSTOKA] Rim Abdulovich, are you not putting the question a little too dramatically? There are some specialists after all, both here in our republic and beyond its borders, who are proposing projects not only to supply water but also to fill the Aral.

[Giniyatullin] There are presently 15-20 hundredths of a hectare of irrigated land per capita in all republics of our region; that is already less than what we need. And in the

meantime the population is increasing every year by around a million—the birth rate here is the highest in the country. Moreover the increase is predominantly in the rural population, which relies precisely on irrigated farmland as its main source of life support. This means that in order to maintain the present level of consumption, each year we have to put 50,000-100,000 new hectares of land to use just in Uzbekistan alone, and with even the most economic care this will require 700 million cubic meters of water. Very soon there will be no place from which to get it.

[PRAVDA VOSTOKA] But there are other ways—increasing yields, and introducing water saving procedures. Moreover there are plans for the accelerated development of the processing industry, which would compensate for the added people.

[Giniyatullin] Yes, the opinion that land improvement measures have been neglected in the republic has been spreading vigorously in recent years. I disagree with it entirely, and I can offer enough arguments to support this. Uzbek dekhkane [peasants] are characterized by their farming excellence. The average productivity of cotton fiber per hectare is, for example, six centners in the United States, 2.4 in India, 7.2 in Turkey, and close to eight centners in Uzbekistan, and in terms of water use we are below most of these countries. Note that all of them are located south of the 40th parallel, while we are north of it.

Half of all irrigated land in our republic is subjected to salinization and requires leaching. And this means additional outlays of moisture. All of this notwithstanding, water consumption per hectare of crop land has decreased significantly in recent years—from 17,000-19,000 to 10,000 cubic meters. Of course even here there are sizable reserves. But let us ask ourselves: What will all of this cost? An Israeli company introduced drip irrigation and sprinkling on a thousand hectares of the Savay Sovkhoz, Andizhan Oblast—for a price tag of \$7 million. And operating expenses are another \$400 to \$800 per hectare annually. Our own drip irrigation systems, which we introduced last year on 2,000 hectares, are somewhat cheaper. We could have done more, but there is no polyethylene, and nowhere to get it from. In any case we would have to invest up to 25 billion rubles [R] to reduce water outlays by a tenth in the republic as a whole. And if we do find the money, and are able to invest as much as a billion a year, we would not finish the work until the year 2015. By that time the republic's population will have increased by two and a half times. Will we manage to feed and provide jobs for everyone?

Nor can we seriously hope for some kind of urbanization revolution, where 12 million or so people turn to industry in just a few years. Sizable assets are required, you see, to organize each work station—up to R100,000. Consequently the count once again reaches up to many, many billions.

[PRAVDA VOSTOKA] Then what do you have to say about the numerous conceptions and projects for a solution of the water problem?

[Giniyatullin] There are in fact many today. But unfortunately not one of them can withstand expert scrutiny of any seriousness. As an example, draining all the reservoirs and reorienting the rural population to orchard farming was proposed. But this would mean that irrigated farming would remain only in river floodplains, which would simply lead to economic failure, to famine. We find certain scientists and writers to be astoundingly out of touch with reality. To them the region is some sort of abstract space where irrigation water flows freely in support of cultivation of moisture-intensive, unfeasible agricultural crops like cotton, rice, and so on, to someone's benefit. It is as if the millions of people who live on this land because of this water and who selected precisely these crops as the most acceptable do not exist. Has anyone asked a dekhkanin of the Aral region what could grow on the salinized land and in mineralized water besides rice? The answer would be that for the moment there are no alternatives. And before proposing that cotton plantations be reduced by millions of hectares, it would be nice to think about where the millions of people living on this land would go.

Calling for the comprehensive reconstruction of all land and estimating the cost of this work at R60 million (at today's prices it would even spill over a hundred million), the authors of one such concept do not even hint at where these colossal amounts might come from.

Or there is the proposal to fill the Aral from underground sources—that is, to sink wells throughout the republic, collect the water, and send it there through canals of some sort. Two minutes would be enough to prove the absurdity of this undertaking; however, remember how much noise there was in the press, how much the Ministry of Water Resources was reprimanded for supposedly not wanting to carry out a project that would save the people.

One scientist says that the Aral could be saved by ultradeep plowing. It is true that a water savings could be achieved by plowing the soil down to almost a meter. But just think about it: How are you going to introduce a heavy plow that deep into the soil, and plow it? You are going to need ultrapowerful, heavy tractors, of which we have none at all, and then consider how much fuel we would need.

[PRAVDA VOSTOKA] There are many such "panaceas." The republic's intellectual forces are at odds with each other, pulling every which way. And in the meantime what Uzbekistan obviously needs now is a unified national program for survival in the conditions of a continually increasing shortage of water resources.

[Giniyatullin] But to begin with we need to understand that there will not be any water resources in the region with which to restore the Aral either today or in the future. It is also time to stop looking for culprits, all the



more so because the waters of the Aral fed the entire country's economy for many decades. The volume of water consumed by farms today, and in the future all the more so, is such that the level of the sea will continue to fall. Therefore whatever the conditions, we must take steps to protect the living conditions of the population in the Aral region.

We should begin implementing severe measures to regulate water consumption at the level of a national program. And the main thing we must do is put the irrigation and draining network and the land itself in a state that would permit us to count on additional water resources.

Every year that passes means the accumulation and multiplication of problems, which we will then have to solve later on anyway, though with greater outlays and costs. And in the meantime assets allocated to land improvement were halved in the last few years. Moreover, up to half of these assets have already been earmarked for the construction of social, cultural, and personal service facilities. If we continue to orient ourselves on the comprehensive reconstruction of land, where the cost of a hectare is now as much as R10,000, given present investments it would take half a century to finish this program.

Lining irrigation canals should become the most important statewide task, since only one out of every 10 kilometers of them is equipped with filtration protection today. This is precisely where we need to concentrate assets and material resources. We also need measures to reduce dumping of untreated wastes from industrial enterprises and farms into irrigation canals and rivers. An intensive effort to create a protective zone in the lower reaches of the Amu-Darya, to plant tree seedlings, and to restore the denuded bottom lands throughout the entire zone of cultural development is needed.

And of course it is high time to lay the raw material, technology and production base of entirely new irrigation practices based on modern principles of irrigation, including drip irrigation.

Solution of these major problems must be included in the national program and supported appropriately. Let me emphasize that we are talking here about survival.

[PRAVDA VOSTOKA] Yes, this will require a tremendous amount of money. Would it not help to introduce fees for water use? Might they not force collective and private farms to seek ways to economize?

[Giniyatullin] This is a very complex issue. In the climatic conditions of our region, water is obviously first a part of the human environment, and after that a natural resource. In Central Asia we can not consider land apart from water, and the irrigation network is an inseparable part of the land fund. Would it be permissible in our conditions not to give water to a city or a town if they do not have enough money to pay?

Recall that half of our farms are subsidized or unprofitable, and for them even if the water money were incorporated into procurement prices it would not be enough. And how will it be for the 3 million families making use of hundreds of thousands of hectares of irrigated land? We know what their incomes are like.

Moreover, as I said earlier, the effectiveness with which water is being utilized in the republic is already rather high. This in principle predetermines the fact that we will not enjoy a significant savings from introducing fees for water use. The outlays that will be required of each farm in order to save just 10 percent of water use would be up to R2,000 per hectare, which exceeds the possible benefit of economizing by hundreds of times.

In a word, introducing paid water use involves an entire complex of problems—economic, social, political, ecological. No one has looked at them seriously yet. There is a total lack of legal support for a system for selling water. But no one is about to remove this issue from the agenda for good. Scientific developments must be continued.

Fighting waste and reinforcing state discipline on water use are another matter. We propose determining, on the basis of data from the Uzbek State Hydrometeorological Committee, water allocations twice a year for the vegetative and intervening periods, and setting firm rates to be paid by all oblasts for exceeding water allocations and for taking water illegally. The penalties should be 20 times the damages. Assets obtained from this could be transferred to the budgets of local soviets for use in landscaping, to plant gardens, to improve water quality, and to put the water networks in order.

[PRAVDA VOSTOKA] In short, we will be able to count only on internal reserves. Does this mean that the water promised to us from outside the region many years ago will never reach us?

[Giniyatullin] For the time being, unfortunately, there is only one thing I can say: None of the planning and exploration foreseen by the well known decree of the Union Government regarding the possible diversion of part of the flow of the Ob and Irtysh is being conducted. We cannot agree with such a situation. This is unjust, and unreasonable. It can be said that the Aral has been sacrificed to the economic interests of the Union. Around 55 cubic meters of the water from our rivers is used to grow products sent outside republics of the region: This would be more than enough to fill the Aral.

Economic integration is not just an empty phrase either. Why build greenhouses in Siberia, and use up enormous quantities of energy, when we have a huge region with 330 sunny days a year?

They talk about supposedly incalculable ecological consequences for Siberia. But we are discussing just three to five percent of the discharge of a huge abundant river. Much more is taken out of the Volga, the Dnepr, and the Mississippi, not to mention the rivers of Central Asia. All the more so if we consider that water would not be



diverted all year but only in spring and in the beginning of summer, when colossal floods develop and paralyze everything along the course of the Siberian rivers. But I must admit that neither side has an absolutely accurate picture of what would happen in either variant, or of the benefits and sacrifices. This would require a project, a model. That is not being done. Yes, the country is in a serious situation, and there is no extra money. This is not an issue that we can economize on. We are talking about the fate of an enormous region, upon which the welfare of the entire country depends in turn.

### Controversy Continues Over Selection of Nuclear Waste Burial Sites

PM1103131992 Moscow KRASNAYA ZVEZDA  
in Russian 10 Mar 92 p 2

[Captain Second Rank V. Gundarov report: "Radioactive 'Cart' Still There..."]

[Text] This is not the first year that the inhabitants of the northwest of Russia have been concerned about this question: Where will the new regional burial site for radioactive waste be constructed? The participants in a conference on this question, held in Murmansk Oblast soviet executive committee, listened to two reports—by V. Perovskiy, chief specialist of the All-Union Planning and Design Scientific Research and Technological Association (the VNIPIET [not further identified] All-Union Association) (St. Petersburg), and by A. Kazakov, scientific leader of the subject of underground burial of radioactive waste at the "Promtekhnologiya" VNIPI [not further identified] (Moscow).

The opinion of Arhangelsk Oblast soviet deputies is known: They are categorically opposed. The inhabitants of the Kola region will not agree to live next to a burial site either.

However, the site has not yet been chosen. The Murmansk conference approved only a point about a competition to elaborate the concept and location of a burial site. Under the terms of the competition the planning documentation must be submitted before 1 June 1992.

Some people might breathe a sigh of relief: Even if they do start building, it will not be soon. But specialists are sounding the alarm.

The acute shortage of means of utilizing and processing radioactive waste is leading to a systematic accumulation of waste in places where ships and ship repairs are based. The technical bases for handling radioactive waste and spent nuclear fuel are the worst bottleneck in the system of ensuring radiation safety and preventing environmental pollution. But the stock of reserve capacities is limited. These are the conclusions of a competent commission.

The northwest of Russia may be likened to a nuclear "furnace." According to the data of the higher schools at Svanvik (Norway) and Milmfelten (Sweden) and the

Kola Regional Ecological Information Center "Ekonord" (Apatity), a nuclear "flame" is raging in almost 250 reactors on ships of the Northern Fleet, in the icebreakers of the Murmansk Marine Shipping Company, and in the Kola Nuclear Electric Power Station. The radioactive waste formed as a result of their operation and the spent nuclear fuel need to be buried. But where? The question remains open. Once again it has not been possible to get the radioactive "cart" moving because of the lack of a clear-cut state program.

### Military Plans Nuclear Waste Dump on Barents Sea Coast

PM1203132592 Moscow Teleradiokompaniya  
Ostankino Television First Program Network  
in Russian 2100 GMT 11 Mar 92

[From the "Novosti" newscast: Video report by L. Obukhova and Ye. Popolzin, from the Kola Peninsula]

[Text] [Obukhova] While Murmansk people's deputies are trying to fight off plans to build a nuclear waste burial installation on Novaya Zemlya, the military-industrial complex is building a nuclear waste burial ground in Iokanga on the Barents Sea coast behind a veil of secrecy, taking advantage of the fact that the site is located in a closed military zone. Not even the indigenous inhabitants of the nearby Lovozerskiy Rayon have been notified. They have learned of the nuclear burial site construction only by hearsay, from relatives and friends who work at the military base in Iokanga.

[Unidentified woman] Iokanga is a last remaining outpost not touched by the progress of technology and civilization, so to speak. Now a nuclear waste burial ground is to be built there. Meanwhile everywhere else disarmament is in progress. This is the military's doing. Construction was begun and subsequently suspended... But ultimately, I am convinced, they will build it. And while the military are free to leave the North when they reach retirement age, the Saami, that is the indigenous population, have nowhere to go.

### Paper Alleges Kara Sea Dumping of Spent Nuclear Reactors

LD2503214892 Moscow Radio Rossii Network  
in Russian 0900 GMT 25 Mar 92

[Text] According to the Murmansk oblast newspaper SOVETSKIY MURMAN, at least 15 nuclear reactors which have come to the end of their useful life from civilian and military nuclear-powered vessels have been sunk in the Kara sea not far from Novaya Zemlya.

The newspaper report cites Andrey Zolotkov, a peoples' deputy of the former USSR, and information from experts of the international ecological organization Greenpeace.

### **Estonia's Sillamäe Radioactive Waste Reservoir Threat to Gulf of Finland**

*92UN0145D Stockholm EESTI PAEVALEHT  
in Estonian, 7 Feb 92 p 1*

[Based on article by Monica Sandbäck: "Uranium Waste in Estonia Poses Threat to Gulf of Finland"]

[Text] **DAGENS INDUSTRI's** Monica Sandbäck describes storage reservoirs for radioactive waste at Sillamäe and at Saku that are far from meeting safety standards—neither Eastern nor Western. At Sillamäe, for example, there is an open pond that is full of water containing uranium and heavy metals. This is located only 15 meters from the Gulf of Finland, and 20 meters above sea level.

For more than 40 years now, waste materials have been pumped into it from the Sillamäe factory that manufactures, among other things, uranium out of oil shale. One of the Sillamäe employees volunteers that the pond contains 1,000 tons of uranium, 500 tons of thorium, up to 30,000 tons of calcium fluoride, up to 900,000 tons of oil shale ash particles and up to 600,000 tons of calcium sulphate. Altogether, the pond contains 5 to 6 million tons of waste.

There is a continuous leakage of poisonous water out of the pond—at one time even the dam collapsed and poisons came pouring out but, fortunately, toward the land. The size of the pond is 36,000 square meters, measuring roughly 190x190 meters. Should the dam give way toward the sea, poison would be flowing directly toward the Gulf of Finland and damage other states besides Estonia, Tõive Kivikas, executive director of Studsvik AB tells DI [DAGENS INDUSTRI].

Studsvik AB, along with Estonian authorities, recently did a study of radioactive radiation in Estonia. There had been a certain amount of anxiety after the Chernobyl disaster, and requests were made to carry out measurements with instruments calibrated in the West. The reports of Russian authorities could not be trusted, and this mistrust kept growing when it turned out that certain food shipments from Russia had come just from the Chernobyl region.

The necessary equipment was shipped in and measurements were taken all across Estonia. It was reported, with relief, that radiation values were good, except in some special areas, Tõive Kivikas says. In general, Estonia's values are clearly lower than those of the Gävle region that was hit quite hard by the Chernobyl accident.

Cleaning up Sillamäe would be similar to the Ranstad operation that cost roughly 120 million Krona to clean from uranium waste. However, Sillamäe would be more expensive, and more complicated, because the waste pond is so close to the sea. But that is what makes the clean-up even more necessary, Kivikas says, referring to

a plan in which the necessary technology would be supplied by Studsvik, and Estonia would take charge of carrying out the task.

The other necessary project would be the so-called final storage of radioactive waste located at Saku—Saku is only 10 kilometers from Tallinn. This is where radioactive waste is shipped from all over Estonia. Solid waste is kept in concrete bunkers, at the depth of only a few meters.

Liquid waste is pumped directly into a rustproof container, via two buried pipes equipped with simple locks. From Sweden's point of view, this equipment is in extremely poor condition. Above all, Estonia needs a completely new system for producing energy. The thermal power plants operating on oil shale, and the Lithuanian atomic power plant at Ignalina should be closed down. In the meantime, some of the worst emissions could be removed, at least, by making use of certain filters, Tõive Kivikas thinks.

Estonia's thermal power plants are currently emitting huge, unfiltered quantities of waste into the air but, in addition to these, there are also nuclear reactors at the Russian bases that cannot be monitored by Estonian authorities.

### **St Petersburg, Baltic States To Investigate CW Dumping in Baltic**

*LD1503201992 Moscow Radio Rossii Network  
in Russian 2000 GMT 14 Mar 92*

[Report by station correspondent Denis Gurinskiy]

[Text] The administration of St. Petersburg has begun consultations with the authorities of the Baltic states concerning a joint investigation into almost 400,000 tons of military toxic substances submerged in the Baltic Sea. Over to our correspondent, Denis Gurinskiy.

[Gurinskiy] Mayor of St. Petersburg Sobchak and his deputy Shcherbakov were the initiators of such consultations on the Russian side. The former sent a personal appeal to the authorities of the Baltic countries inviting them to talks on the fate of the military toxic substances submerged in the Baltic, while the latter commenced elaborating a practical plan for an expert investigation into the discarded explosives.

Deputy Mayor of St. Petersburg, Vice Admiral Vyacheslav Shcherbakov stated at a briefing on Friday that the St. Petersburg mayor's office hopes to conduct an expert investigation into these substances and protective containers as early as this summer. Shcherbakov showed journalists a formerly secret map which depicts two regions in the Baltic Sea where, according to rough calculations, between 1946 and 1948 at least 400,000 tons of explosive chemical shells were submerged.

Under a trilateral treaty, the United States, Great Britain, and the Soviet Union submerged chemical shells

of the Wehrmacht and their own. At that time the shells were concentrated within 50 miles of the Danish island of Bornholm, and 30 miles off the Latvian port of Liepaja. But now, according to Shcherbakov, their disposition has been extended as a result of maritime drift.

The deputy mayor of St. Petersburg did not deny the version whereby Stalin allegedly buried around 40,000 tons of Soviet highly active chemical bombs in these regions. At the same time, Shcherbakov noted that he has been unable to find documentary confirmation of this version in the maritime archives of the Main Command of the CIS Navy. On the other hand, he has come across numerous dispatches sent to Gorbachev in recent years from the military and intelligence leadership of the country, calling for an inspection of the submerged weapons to be conducted. But right up until his resignation, Gorbachev had not responded to this problem.

Now, according to Shcherbakov, President Yeltsin has given the St. Petersburg mayor's office approval to hold talks with the Baltic countries with the aim of a speedy investigation into the state of the submerged shells, and has recommended the Russian Ministry of Foreign Affairs to ensure the involvement of the United States and Great Britain in this expedition. The deputy mayor of St. Petersburg expressed the hope that by May it will be possible to agree a draft on the work of the expedition, to which end he intends to convene a closed conference of chemical scientists from Russia and other Baltic countries on 18 March in the Smolnyy.

### **Threat From Chemical Weapons Dumped in Baltic Denied**

*PM1803182192 Moscow KRASNAYA ZVEZDA  
in Russian 18 Mar 92 p 3*

[Report by Captain Second Rank Yu. Golovin: "Chemical Catastrophe in Baltic: Stories and Reality"]

[Text] Baltic Fleet Press Center—The decision of the anti-Hitler coalition countries to bury in the Baltic Sea bed war gases from Germany's arsenals is again the focus of attention 46 years after the event.

The mass media of Russia and the Baltic states are increasingly turning to this topic, which bears the obvious imprint of sensationalism. A number of newspapers report that hundreds of thousands of tons of war gases—sarin, mustard gas, phosgene, tabun, and other war gases—have been buried in the Baltic Sea. If there is a mass leakage because of the destruction of the casing of the containers, shells, and bombs, they warn, the sea will die and irreparable damage could be caused to the health of 30 million people living around the Baltic...

This information was preceded by the publication in the German newspapers *FLENSBURGER TAGEBLATT* and *DIE WELT* of interviews with Doctor O. Khennig [name as transliterated] in which he claims that during a visit to Kaliningrad he received the consent of the Baltic Fleet commander to hold joint operations in the Baltic to

seek and destroy stocks of chemicals dumped during World War II in the regions of the island of Bornholm and Skagerrak Strait. It emerges from the interview that the German side will be provided with the necessary archive materials and the trawlers' joint operations may begin as early as this year. According to the information in the German newspapers, in this connection FRG Defense Minister G. Stoltenberg has already given entirely specific instructions on checking the feasibility of plans for a joint operation and the possibility of enlisting FRG Navy trawlers, which have experience of operations in the Persian Gulf.

But if we return to the minutes of the meeting in Kaliningrad, it turns out that Doctor Khennig was over-hasty in organizing the operations to "save" the Baltic Sea. Admiral V. Yegorov, commander of the Baltic Fleet, has indeed confirmed that chemical ammunition is buried at sea. But, he said, "the fleet does not have precise information about its submersion."

It is clear from Admiral V. Yegorov's talk with Dr. O. Khennig that the fleet does not intend to remove the problem of the chemical ammunition on the Baltic Sea bed from the agenda, although there were no specific proposals from the commander of the Baltic Fleet. In the opinion of Captain First Rank Yu. Yefimov, chief of the Baltic Fleet chemical warfare service, it is merely necessary to view the questions which have been raised on a somewhat different plane.

The decision to submerge the war gases from Germany's depots was made by the anti-Hitler coalition countries and carried out in the 1945-1946 period under the leadership of the USSR Armed Forces General Staff. The Baltic Fleet's participation in the operation was limited to determining the sites for submersion and to navigational backup. The archives of the Baltic Fleet and the Navy do not contain documents on the organization of the burial, its precise coordinates, or the quantity of chemical ammunition submerged. But it is known that war gases like mustard gas, tabun, and phosgene were buried (at that time sarin, for one, was not yet being produced).

There is no reason to speak of the massive discharge of war gases from the casings of shells, bombs, and other containers. This process can only be of an "evolutionary" nature under the natural influence of the environment. The leakage of war gases over past decades may and even should have happened. But here we must consider that over such a large interval of time the war gases have to a considerable extent lost their toxicity and then they gradually seep into the water they are hydrolyzed. This can be proved indirectly but very convincingly by the studies carried out in the period from January 1983 through July 1984 by the workers of the

Baltic Fleet's 28th chemical laboratory under the leadership of Captain Third Rank I. Bondarenko. Any interference in the natural process of the chemical ammunition's breakdown could cause unpredictable consequences and not prevent, but on the contrary, accelerate catastrophe.

### **Estonia, Finland To Cooperate on Environmental Concerns**

*LD1103211292 Tallinn Radio Tallinn Network  
in Estonian 1800 GMT 10 Mar 92*

[Report by Riina Eentalu]

[Excerpts] As the Finnish Environment Ministry also deals with construction matters, Finnish Environment Minister Sirppa Pietikainen and Estonian Construction Minister Olari Taal signed a protocol on cooperation in the sphere of building design.

[Begin Pietikainen recording] With respect to Estonia, comprehensive cooperation was discussed. For example, in the Narva region measures to improve the environment will be combined with future projects so that damage to the environment will be as slight as possible. In the future this should be a continuous process, with an evaluation as to in what manner and to what degree a project is going to effect the environment, the people's living conditions, or even their cultural environment becoming a normal component of any project from the very start. [end recording]

After lunch there were talks at the Ministry of the Environment. A new cooperation protocol was signed. Let us recall that the intergovernmental environmental cooperation agreement signed on 7 November came into

force on 2 March. That agreement covers two specific projects: purification of sulphur compounds that are emitted into the atmosphere in Narva, at the Baltic thermal power station—in cooperation with Finland a test device will be built to reduce atmospheric pollution—and the other project is to do with resolving the issue of waste water in Tallinn. It was acknowledged today that matters are progressing in a normal manner and a new protocol was signed. Minister Tonis Kaasik, what would you say?

[Begin Kaasik recording] We have signed today a new cooperation protocol concerning trial production of water chemicals in Tallinn. This is the biggest problem for us with the purification of drinking water in Tallinn: the absence of corresponding chemicals and obtaining supplies from Russia. Now preparatory work has begun to build a plant to produce corresponding chemicals in Tallinn.

Second, we signed a cooperation project to reduce the workload of waste water in Kohtla-Järve area, and also to obtain an adequate idea of the waste water accumulating there. There is also a specific cooperation agreement concerning the joint construction of a purification plant for the Viinistu fishery. [passage omitted] Later it will be possible to apply the same technology at other Estonian fisheries. [end recording] [passage omitted]

An agreement on additional training on environmental matters for 1992-1993 was also signed today.

And something else: Finland is, naturally, largely the provider in all this, but Sirppa Pietikainen emphasized another essential aspect in cooperation: the international aspect. So many international organizations deal with environmental matters that it is beneficial to act jointly in this sphere and help each other.

## REGIONAL AFFAIRS

**Progress of Joint European Torus Experiments Detailed***92WS0212C Paris LE MONDE in French 4 Dec 91  
p 18*

[Article by Jean-Francois Augereau: "Reinventing the Stars"]

[Text] Despite the Europeans' recent success, the race toward thermonuclear fusion will demand still more effort, time, and money.

The advance achieved by European physicists when, around the beginning of November, they succeeded in producing "a significant quantity of energy" by thermonuclear fusion (LE MONDE 12 November), has opened a door toward the harnessing of a practically unlimited source of energy. For two seconds, teams led by Paul-Henri Rebut, director of the Joint European Torus [JET] at Culham, in Great Britain, obtained approximately 1 megawatt of energy in their strange machine. A tiny amount compared to the 3,000 megawatts or so of thermonuclear energy being produced by the fission of uranium<sup>(1)</sup> in the nuclear reactors of the EDF [French Electric Power Company]. But an important result considering the numerous disappointments this form of energy has so often engendered.

The aim of the physicists is to recreate the energy of the stars in a bottle. A very special bottle, to be sure, whose shape, conceived almost 40 years ago by physicists of the Soviet Kurchatov Institute, resembles a metallic inner tube approximately 3 meters in diameter—the torus—containing the highest possible vacuum, and embedded in a jumble of electric cabling, conduits, and tubes of all sorts, from which the outlines of huge coils emerge here and there, that are capable of generating powerful magnetic fields.

It is hard to imagine easily harnessing an energy that manifests itself at temperatures of 200 million degrees, or 10 times higher than those reigning inside the sun! No known material is capable of withstanding a furnace heat of that magnitude. Hence the development of these famous tori, better known by their Soviet name of "tokamak(s)," whose magnetic fields make it possible to contain, distant from the walls of the inner toroidal chamber thus formed, the gaseous mixture that will be introduced into the chamber, then heated to plasma temperature—a plasma of deuterium and tritium<sup>(2)</sup>.

**Passport to Ignition**

When research began more than three decades ago, enthusiasm was such that many imagined the problems would be quickly resolved. But nature has imposed its law and has often sown the seed of doubt in the minds of the most confident researchers. Not just anyone can harness the sun. It has taken 30 years of patient research to attain the remarkable, yet very preliminary, result

achieved by the JET team. Today, no one is failing to recognize the truth: It will be another 50 or 60 years before a fusion reactor on a commercial scale sees the light of day.

The tiny step attained in Great Britain is being assessed as follows: "A tiny step but a decisive one," says Robert Aymar, the AEC [Atomic Energy Commission] director of materials sciences. "It is true," he says, "that the JET experiment is symbolic. But it confirms the advances that have been made and, more importantly, augurs well for the prospects." True, the JET, the world's best fusion machine at this time, is still distant from that frontier that is termed the break-even point, the operating point at which the fusion reactor produces as much energy as it consumes. As of now, the JET consumes several tens of megawatts to heat the plasma, whose nuclear reactions produce no more than 1 megawatt... And for only two seconds.

Thus, it is easier to measure the advances still needing to be made in order to merely come within striking distance of the target. Clearly, it will be extremely difficult to attain, then to pass, the point defined by the Lawson criterion, the somewhat mythical law that combines, as if by magic, the temperature of the plasma, its density, and its duration. Lacking this minimal passport, no salute. Lacking it, the physicists will not attain the second stage—termed ignition—in the harnessing of thermonuclear fusion. The stage in which the fusion reaction within the machine becomes self-sustaining.

At this time, the JET is flirting with ignition. At peak performance, the product of plasma density (number of particles per cubic meter) multiplied by the temperature attained and by duration of the reaction came to around eight followed by 20 zeros. "Now," says one specialist, "we must attain at least a figure of five followed by 21 zeros." The meanings of such figures are beyond the ken of the uninitiated. But simply put, they mean that it will be several years yet before the physicists can hope to claim victory, and before "Lawson," in a manner of speaking, "will have thrown in the sponge." A step has been commenced at Culham. For there to be a more decisive breakthrough to another stage, others will be necessary, some of which are not solely of a technical nature.

**The Cold Fusion War**

The ball is therefore still in the physicists' court. Following the successful November experiment, in which, for the first time, a small amount (0.2 g) of tritium was injected into the machine, the Culham teams plan to shut down the JET around the beginning of 1992 for a period of 18 months. This shutdown is made necessary by the need to analyze the results of the experiment before a new experiment can be undertaken. But also by the fact that the use of tritium, a radioactive isotope of hydrogen, has made the interior of the installation slightly radioactive.



"We must avoid too high a level of residual radioactivity of the machine, so as to be able to test new setups with a greater margin of assurance before starting a new and more epochal experiment." Following this forced 18-month shutdown, a new period of approximately 18 months of operation will begin around mid-1993, without tritium, with deuterium alone. Only after the gradual introduction of increasing quantities of tritium will the final program begin that is to lead to the injection of equivalent quantities of tritium and deuterium into the torus.

At that point, if everything goes well, the Lawson frontier should not be distant. A milestone will have been attained in 1996 with the dismantlement of the JET, which, after 13 years of good and loyal service, will have enabled Europe, as in the case of particle physics, to play a leading role in the race toward fusion. Another lap in the race will undoubtedly begin with the initial tremors within the scientific community with sights set on starting up the next-generation machine.

Several countries are in the running, including the Americans, whose TFTR [Tokamak Fusion Test Reactor] at Princeton has just seen Culham steal a march on it; the Japanese, whose JT-60 is taking its toddling steps; and the Soviets, fathers of the technique, whose T-15 is having so many problems getting off the ground that many doubt that it will ever rival existing installations. In this context, each country is feathering its own nest, bent on playing the leading role when the time comes to play it.

Very early on, the Europeans gave some thought to what the next-generation machine should be like. They even gave it a name: the NET for Next European Torus. In 1990, they froze the objectives of this new installation, and set 1996 as the date for a decision on the project. The cost of this operation: ECU3 billion, or around 21 billion francs[Fr].

In view of the size of the financing needed (3), thought was given to the idea of cooperation on a global scale. In 1987, President Gorbachev proposed to the other heads of state that the Americans, Europeans, Japanese and Soviets all agree to cooperate in building a joint ITER [International Thermonuclear Experimental Reactor]. In February 1988, the 12 member countries of the EEC grudgingly endorsed a cooperation based on this project, on condition, however, that it be headed by the International Atomic Energy Agency.

#### Oceanic Riches

At the outset, it was all somewhat vague, distant in time, and of a nature to preserve the interests of each. But events moved fast. Unofficial agreements, not always technical ones, were entered into, and the Europeans suddenly found themselves somewhat on the outside of things. There can be no doubt that JET's most recent performance enables them now to negotiate from strength for moving from the studies that defined the general outlines of the ITER project to specifying the

content of the machine. "We," say the Europeans, "do not want any part of an ambitious all-purpose machine. Progress has to be made step by step, and the objectives of ITER must be limited to those of the NET."

"Only in this way will we be able to work," say the Europeans, provided also that a solution is found to the political problems inherent in all international projects, and that the United States does not come out with one of those scenarios in which it holds the secret, and everyone is expected to work while it controls the entire undertaking. There will have to be meetings and more meetings beyond those in Washington, Vienna, Brussels, Tokyo, and those of 13 and 14 November 1991 in Moscow, to agree on and launch this new machine, which, if all goes well, is to be operational by 2005. "The only sure thing," says one specialist, "is that it will not be ITER and the NET, but ITER or the NET."

One thing is certain. Whatever the difficulties encountered, be they political or technical, the race to harness fusion will continue. The stakes are extremely high, for if, within half a century, controlled fusion of the atom becomes a reality, humanity will then have an almost unlimited source of energy. The fuel these reactors will burn exists in abundant quantities. Deuterium is present everywhere on Earth. Especially in the oceans, where this heavy hydrogen atom combines with oxygen to form... heavy water, of course.

Seawater contains one molecule of heavy water—that is, a molecule containing two atoms of deuterium—for every 6,000 molecules of light water. More simply stated, there are 40 milligrams of deuterium per liter of seawater. And since the oceans represent a volume of some 1.3 billion cubic kilometers, they are a practically unlimited reserve at our disposal, at a relatively very low cost of extraction.

Tritium, the second ingredient of the reaction, does not exist in nature. It too, however, is no problem. Suffice it to utilize the neutrons produced by the fusion reaction, which in contact with a coating of lithium (a chemical element that is also very abundant) produces the necessary quantities of tritium. It is all very simple on paper, and some may be ready to sell the idea that fusion is a tomorrow morning thing. But there is a great deal of road to be traveled before the combustion of a few kilograms of a mixture of deuterium and tritium, from lithium, can be made to produce as much energy as 10,000 tons of oil.

The tiny megawatt produced by the JET for two seconds seems very distant from the mark, and the physicists in the midst of the debate know very well that before thinking of installing plants to produce deuterium and tritium they will have to resolve the problems of overheating of the machine, problems of strength of materials, and problems of stability of the plasma, and be able to design and build an installation capable of attaining and sustaining the state of ignition for durations of 1,000 seconds.

It could be ITER, and in that case the difficulties will not stem from fuel supplies, since several sources will be available to supply the 20 kilograms or so of tritium necessary for a period of 10 years: the Canadian Candu type of nuclear plants, the installations in countries that have a military nuclear program, and military stockpiles, some of which will be dismantled.

Instead, the scientific community will have to progress and come to an understanding, enabling it, in a successive stage, to demonstrate the "feasibility" of a nuclear fusion reactor, and then to verify that the cost of an initial prototype will not exceed by more than three to five times that of a conventional nuclear reactor of the same power. "Today," says Robert Aymar, "there is nothing on the horizon that could possibly prevent us from arriving."

But he warns that "while it is undeniable that this form of energy will be more abundant, cleaner, and safer (a Chernobyl is impossible, since the reaction extinguishes itself when the plasma cools), it will nevertheless produce, like its distant sister, fission, waste equivalent to that produced by fission reactors."

#### Footnotes

1. In a fission reaction the heavy nuclei of the uranium and plutonium atoms shatter into several pieces under the impact of the neutrons and thus release large quantities of energy. In fusion, on the contrary, the light nuclei of hydrogen, deuterium, and tritium fuse among themselves to form helium nuclei and release energy in the form of a neutron flux.

2. Deuterium and tritium are two isotopes of hydrogen, two first cousins of sorts, that are sometimes given the names heavy hydrogen and superheavy hydrogen. Unlike deuterium, tritium is not present in nature. It is radioactive and loses half of its radioactivity (half-life) every 12 years.

3. Europe devotes ECU400 million (Fr2.8 billion) annually to research in thermonuclear fusion, versus spending of around \$200 million (Fr1.12 billion) by the United States and Japan. France (which participates in the JET to the extent of 20 percent) spends Fr340 million annually. Germany, two or three times more.

### BELGIUM

#### Flemish Energy Technology Program Approved

92AN0174A Antwerp DE FINANCIEEL-  
EKONOMISCHE TIJD in Dutch 20 Dec 91 p 3

[Excerpts] Brussels—Yesterday, the Flemish Government gave the green light for the Energy Technology Impulse Program which was proposed some time ago by Minister of Economy De Batselier. [passage omitted]

The Flemish Energy Technology Impulse Program (VLIET) runs from 1992 to 1995 and is allocated a

budget of 800 million Belgian francs (BFr). The program focuses primarily on techniques to stimulate energy savings and the use of renewable forms of energy. There is a preference for techniques which are in the final stages and consequently can be put on the market rapidly.

A minimum of 15 percent (BFr120 million) of the program budget will be spent on policy supporting research which focuses on technological aspects research (better known as technology assessment or the research into the social implications of new techniques). At least 25 percent (BFr200 million) is reserved for renewable energy techniques.

The Institute for Scientific Technological Research in Industry (IWT) is in charge of carrying out the impulse program. The institute will also be responsible for selecting projects. Operational costs may not exceed 10 percent of the budget. The remainder is meant for financial support of projects which are expected to be put forward primarily by industry. [passage omitted]

### GERMANY

#### Genetically Modified Plants Negate Effects of Pesticides

92MI0225A Bonn DIE WELT in German 20 Jan 92  
p 19

[Article by Michael Lange: "Unforseeable Environmental Consequences—A Genetically Manipulated Tobacco Plant Can Turn Herbicides into Fertilizer"]

[Excerpt] [Passage omitted] Professor Guido Hartmann and his colleagues at Munich University's Institute of Biochemistry have now succeeded in modifying tobacco plants so that they not only convert a herbicide, but are able to recycle the substance so created and to do so in such a way that no dangerous substances remain in the plant. An enzyme that the researchers found in the soil fungus *myrothecium verrucaria* is responsible for this. It enables the fungus to convert the herbicide cyanamide, which is used in vegetable and hop growing, for example, into urea.

The biochemists used what are now well-established genetic engineering methods to isolate the gene that stores the enzyme formation information from the fungus' genetic material and transfer it into the tobacco cells. In order to do this, they first made a "gene cassette," packaging the gene into the genetic information of the cauliflower mosaic virus. *Agrobacterium tumefaciens*, a microorganism that is frequently used as a "gene ferry," was then used to carry the fungus gene into the plant cells.

When the scientists had regenerated the manipulated tobacco cells again to form complete plants, they were able to measure the activity of the fungus enzyme in 15 specimens. The enzyme converted sprayed cyanamide

into urea in both the roots and the leaves. This made the plants resistant. Spraying with the 5 percent cyanamide solution usual in agriculture, had no further effect on them.

The urea produced is not just a harmless waste product: The plants can process it further because enzymes involved in plant metabolism release the nitrogen content of the urea as ammonium. This is a valuable nutrient for all plants, as it ensures they are supplied with nitrogen. As a result, cyanamide actually promotes the growth of the tobacco plants: The herbicide becomes a fertilizer.

If the genetic engineers succeed in equipping other crop plants with the resistance gene from the fungus in the same way as with the genetic model tobacco, plant protective cyanamide, which has been little used to date, will doubtless have a brilliant future, much to the delight of its manufacturer Trostberg, which sponsored the Munich biochemists' work jointly with the Chemical Industry Fund.

However, the recent successes of this privately-sponsored research do present an ecological problem. Although the herbicide is highly biodegradable, if it is sprayed onto fields in excessive quantities it could damage the soil or find its way into the ground water. The danger of the farmer using too much of the poison would be higher than with other herbicides because it would have no harmful effects on crops. Like every new herbicide-resistant plant, the new tobacco represents an additional threat to the already dwindling variety of species to be found in and near fields.

#### Development of Geothermal Energy in East Germany

92WS0331B Munich SUEDEDEUTSCHE ZEITUNG  
in German 30 Jan 92 p 49

[Article by Martin Schneider: "Heat That Comes From the Deep"]

[Text] After German unification, just as in the times of the GDR, the brown coal clouds hang heavy in the air over the cities in the East. Waren am Mueritzsee in Mecklenburg is no exception in this context. Only in Erich-Weinert Street is it easier to breathe. Here, 806 apartments are being heated with 60° water from a depth of 1,500 meters.

Primarily because of the chronic lack of foreign currency, the GDR invested in clean heat from the depth of the earth. In addition to the facility in Waren, during the 1980's two more power plants, which deliver a total of 22 megawatts of thermal power, were built in Prenzlau and Neubrandenburg. This has made it possible to save more than 26,000 tons of brown coal so far. Plans and explorations for additional sites had progressed so far that by the turn of the century 300 megawatts were to supply comfortable heat in Eastern German apartments.

#### Positive 'Old Burdens'

In order not to squander the opportunity of getting a positive "old burden" from the GDR in this environmentally beneficial form of energy, the Federal Research and Environment Ministry has decided to use three facilities to demonstrate that geothermal energy can also be used economically. Potential sites have been discussed for months, and the decision is to be made in February.

Four and a half billion years ago, enormous quantities of dust and gas contracted in the universe. The gravitational energy was thereby completely transformed into heat and enabled the creation of a fire ball—our planets. This glow continues to live in the earth's interior. More importantly, however, it is constantly fanned by the decomposition of naturally radioactive isotopes—primarily uranium, thorium and potassium. The heat contained in the upper 10 kilometers of the earth's crust alone would be sufficient to operate a million 200-megawatt power plants for 10,000 years.

That is, theoretically. But initially, Mother Earth has to be enticed to give up her heat. Until now this has taken place exclusively by "hydrothermal" means, by using hot water or steam from deep down. This is particularly profitable in tectonically active areas, where magma chambers extend far up under the surface and heat the water to several hundred degrees. While normally the temperature increases by 30° for each kilometer of depth, in Iceland, for example, temperatures of 1,000° are already found at a few hundred meters.

If the water is hotter than 150°C, it can be used for power production. About 6,000 megawatt electric power is produced worldwide in this manner. The oldest geothermal power plant is located in Larderello in Italy, 40 kilometers southwest of Siena. The first generator was hooked up to the power grid as early as 1912. The largest producer of "geopower," with a world share of more than 40 percent, is the United States. "The Geysers" geothermal field delivers most of the power for San Francisco. In "geologically more modest" areas, the water is not hot enough to produce power. In some places it can be used for heating purposes, however—as in Waren, Prenzlau and Neubrandenburg. Hot water is pumped from an aquiferous sandstone layer at a depth of 1,500 meters to the surface. Then it is not fed directly to the heating elements, however, but first conducted through a heat exchanger before being pumped back into the deep through a second drill hole. The reason for this is that it cannot become a burden on the waterways due to the often very high salt content. Furthermore, there is danger that the water-carrying layer could be pumped dry from production rates of more than 50 liters a second.

With a total of 33 megawatts from 20 plants, the German share of the 11,000 megawatts of installed geothermal heat production is quite modest, to be sure. In the Paris basin alone, 61 thermal power plants supply more than

200,000 homes with heat from the deep and save approximately 200,000 tons of oil annually. Here as well thermal heat could be used more than up to now. Studies by the Lower Saxony Regional Soil Research Office has demonstrated usable aquiferous strata primarily in the northern German lowland, the southern German soft tertiary sandstone basins between the Danube and the Alps and in Oberrheingraben. The communities in the East, in particular, have the best preconditions for continued expansion of geothermal energy. District heating networks are extensive and the power plants have to be replaced urgently anyhow. "From the times of the old GDR there are many drill holes in Mecklenburg-West Pomerania which can be used immediately," reports Ruediger Schulz of the Lower Saxony Regional Office, "but the problem is that the gas suppliers often beat us to it"—and threaten to cut the ground from under geothermal heat.

So far, however, many cities in the northeast of Germany are interested in geothermal heating. "Everything is waiting for a decision by Bonn as to which plants will be modernized or rebuilt," says Frank Kabus of Geothermie Neubrandenburg GmbH. After being postponed several times, it will now finally get a green light in February. Franz-Josef Schafhausen, in charge of geothermal energy at the Federal Environment Ministry, explains why the mills of bureaucracy grind so slowly in this area: "First we have to wait for the result of an economic-ecological study; after all, no one is served by a hasty site determination, which shortly afterward turns out to be wrong because it is not economical." On no account does one want to create new "subsidy pits."

Since geothermal heat involves no costs for fuel consumption but instead large investments for drilling, profitability is not as easy to calculate as for other fuels. Utilization of geothermal heat is also not entirely without problems. The problem child for operators is above all the high salt content of most thermal waters—in northern Germany, up to 290 grams per liter. This causes the pipelines to corrode. Further, the water is able to release less salt due to the cooling, so that it precipitates, clogs the pipes and in some instances has to be removed and disposed of. In Mecklenburg, however, it is largely a matter of unproblematic table salt.

The major part of the geothermal power cannot be hydrothermally developed, however, since it is stored in dry rock at the deeper levels of the earth's crust. Under our feet as well there are temperatures of at least 200°C at 7 kilometers' depth. But this energy could be used with the so-called "hot dry rock" (HDR) method in Germany as well.

#### Rock as Flash Heater

The HDR method uses the "hot dry rock" as a gigantic flash heater. By means of injection drilling, cold water is pressed far down under high pressure. This produces cracks and fissures—a method known for 40 years as "hydraulic fracturing." In a second drill hole one tries to

hit this crack—and the circulation system is complete. Cold water can then be conducted through the first drill hole into the earth, be heated in the cracks and crevices and subsequently be brought to the surface through the second drill hole in order to drive a turbine. European researchers intend to decide even this year concerning a site for a pilot project for an HDR facility. Under consideration are Bad Urach, Soultz-sous-Forêts in Alsace or Cornwall in England. But even in optimistic evaluations it will be another several decades until this technology is ready for practical application.

#### German Refrigerator Disposal Plant Enters Service

92MI0310A Wuerzburg UMWELTMAGAZIN  
in German No 1/2, Feb 92 p 56

[Text] A new refrigerator plant, according to its operator the most modern in Germany, entered service a year ago in Hoevelhof, Westphalia. It dismantles and disposes of 100,000 scrapped appliances a year without damage to the environment. This is roughly the same number of refrigerators as are thrown out every year by about 3.5 million households in the Federal Republic of Germany. The private disposal company Toensmeier Raw Materials has invested around 3.5 million German marks[DM] in developing and building the new plant. It is a further development on the first "Kentec" plant, which Toensmeier Container Service GmbH has been operating in Hameln since 1989.

Chlorofluorocarbons (CFC's) are still being given off into the atmosphere every day and are destroying the ozone layer in the stratosphere. There are 1,600 tonnes of CFC's just in the cooling circuits and insulating materials of the 2.5 million or so refrigerating appliances that have to be disposed of in the Federal Republic of Germany every year. The aim is to recycle these CFC's as completely as possible.

Toensmeier Group specialists have developed and patented a special technique for refrigerator disposal. This "Kentec" process can be used to reprocess not only liquid coolants, but also the plastics, rubber, glass, metals, motors, electric cables, mercury switches, and foaming agents used in refrigerators.

To facilitate syphoning off the coolant, the refrigerators are first stored at at least 5°C. Then the machine oil and coolant are removed with all due care from the cooling circuit. "This is the first time that used oil and CFC's have been collected separately. Both materials can then be processed and reused by the manufacturer," explains Juergen Toensmeier, the group's managing partner.

The disposal specialists have also developed a process suited to ammonia-operated refrigerators: Ammonia is drawn out of the cooling circuit under pressure. The next step in dismantling them is to remove the motor and glass panels. The motors go to metal and scrap dealers for reprocessing.



### No CFC's Spread Into the Environment

The refrigerators then pass through a man-lock into a low-pressure chamber. They are then reduced in two stages to pieces the size of five-mark coins. The CFC gases contained in the refrigerators' insulating material are released in this process. They are filtered and 100 percent drawn off into a liquefaction plant. The advantage of this process is that pure CFC's are recovered. No gases enter the environment.

The mixed metal and plastics are subsequently separated from one another in three stages. First of all, the Hoevelhof plant recovers ferrous and nonferrous metals separately: A magnet is used to extract the ferrous metals. Next, nonferrous metals such as lead, aluminum, and copper are separated from the polyurethane foam using a whirlpool separator. "By differentiating between ferrous and nonferrous metals, we can recover more metal in Hoevelhof than in the Hameln plant," Toensmeier emphasizes. "At present the polyurethane foam is still dumped, but we aim to be able to reprocess that as well."

### Safety at Work Is the First Concern

Five measuring devices have been installed to protect the 15 employees who work in two shifts at Hoevelhof. An optical and acoustic signal warns them as soon as the CFC concentration reaches 5,600 mg/m<sup>3</sup>. Two sensors in the "treatment room" provide additional security, establishing in good time whether gaseous substances are entering the environment.

"As disposal specialists we are increasingly dismantling factories for the manufacturing industry. Refrigerator reassembly can already be run as a normal production process," says Juergen Toensmeier of one aspect of the disposal company's work.

For example, one large delivery firm takes customer's old refrigerators away when a new one is delivered and has them disposed of in the new plant.

### Bonn, EC Concerned About U.S. Environmental Policy

AU2903144192 Frankfurt/Main FRANKFURTER  
RUNDSCHAU in German 28 Mar 92 p 1

[Joachim Wille report: "Bush's Environmental Policy Alarms Bonn"]

[Text] U.S. President George Bush's refusal to reduce the emission of the greenhouse gas, carbon dioxide (CO<sub>2</sub>), in his country by establishing binding upper ceilings on emissions and time frames for the reduction of them has highly disappointed politicians and environment organizations in the Federal Republic and the European Community. Environment Minister Klaus Toepfer, of the Christian Democratic Union, said that the threatening

climatic changes urgently required coordinated international action, but added that the U.S. position was, however, by no means in keeping with this requirement.

Michael Mueller, the climate expert of the SPD [Social Democratic Party of Germany] Bundestag group, reproached the Bush Administration for "a sort of ecological terrorism." He said that the superpower's "blockade policy" could only be counteracted by an economically strong region like Europe setting an example in this respect.

In the annual environment report for the U.S. Congress, Bush also commented on the world climate convention that will be adopted at the UN summit meeting on the earth in Rio de Janeiro in June. It is supposed to achieve a breakthrough regarding the reduction of greenhouse gases that have an effect on the climate. The President described the allegedly "exclusive concentration on goals and timeframes ... as unreasonable."

In addition, Bush refused to set up a new international fund that would be financed by the industrialized nations and oil-rich countries and would allow the developing countries the transition to environment-friendly technologies. The technological transfer fund is considered a central part of the negotiations in Rio because it would make it easier for developing countries to agree to a "gentle development road."

The U.S. Administration holds the view that all financing tasks should be taken over by the existing energy programs of the World Bank. For this purpose, the United States has increased its contribution to the World Bank by \$50 million to \$200 million.

Following the presentation of the U.S. environmental report, EC Commissioner Ripa de Meana, who is in charge of environmental policy, warned about the possible failure of the Rio summit. He said that by his statements Bush jeopardized the essence of the conference. By the year 2000, the EC wants to see carbon dioxide emissions stabilized at the 1990 level.

Toepfer said that in view of the climatic risks, the negotiations in Rio should "not under any circumstances" fail. "Just as the CSCE has initiated a process of detente in the security area, Rio must initiate a process of detente in the environmental area that should basically redefine political priorities in the world." Toepfer added that Germany would not use the U.S. negative position on the reduction of carbon dioxide "as a pretext" to call the agreed goals on the protection of the climate into question. The Federal Government is seeking to reduce CO<sub>2</sub> emissions 25 to 30 percent by 2005.



## NORWAY

**Former Prime Minister Urges 'Serious' Look at Environmental Ideals***92WN0350A Oslo AFTENPOSTEN in Norwegian  
29 Feb 92 p 2*

[Guest commentary by former Prime Minister Kare Willoch: "Losing One's Credibility"]

[Text] The country's leaders ought to take a serious look at the risk Norway runs of abandoning its ideals in the area of environmental protection and undermining its credibility in the eyes of both the world and Norway's voters, writes former Prime Minister Kare Willoch.

Politicians are worried by the lack of confidence they can encounter among voters. Most elected officials do work hard every day until late at night for the good of society. For that reason there can be an unreasonable feeling when they nonetheless encounter doubt as to their credibility. And to many of them mistrust is unreasonable. But the reasons for a drop in confidence nevertheless are to be found primarily in politics itself. The problem can only be solved by making fewer irresponsible promises which one must keep as long as possible in return. Trygve Bratteli once said: "I promise nothing and in return I shall keep my promise." More [politicians] ought to remember this course of action.

Voters realize that election promises get broken. When impossible promises get upgraded to "a guarantee to the voter" and are then broken even more emphatically than earlier promises, this leaves its mark. Likewise when the production of unrealistic expectations continues, voters are less surprised by the subsequent disappointments than they were previously. But their confidence is undermined still further. Voters cannot be prepared for this, but they perhaps ought to be more careful about judging everything the same way. If voters rewarded reliability better in the voting booths, then there would be more of it in politics.

Even more problematic would be the abandonment of obligations when this extends to our country's credibility in other people's eyes. Yet it can take a long time before the world realizes that a small country is creating a distance between word and deed. But on the other hand it will also take a long time for a small country to regain lost confidence.

**Not Comply With Demands**

We ought to be thinking about this now that there is constantly a greater risk that Norway will cease complying with demands which the country itself has made of others where environmental protection is concerned. The seriousness of this will become greater because in this instance it would not be the first time. One example can illuminate the problem: In the 1980's, Norway harshly criticized British emissions of sulfur dioxide, which produces acid rain. Norwegian politicians used

strong words against the British because they put greater emphasis on avoiding problems in their workplaces than on protecting the atmosphere and the environment.

But Norway had a state-owned firm—in Sulitjelma—which produced more pollution per employee than any British workplace. It alone accounted for approximately 10 percent of Norway's total emission of this poisonous gas even though it employed only 80 people. In 1984 the then nonsocialist government had to propose shutting it down because that was the only way of stopping the scandal. But the Labor Party then opposed this environmental protection initiative and put together a majority in the Storting to oppose the measure. Then, three years later, after the firm had spewed out an additional 50,000 tonnes of sulfur dioxide, a majority decided that the firm had to be shut down: It was primarily huge deficits which led to that result.

**The Ideal and Action**

Today it is primarily emissions of the climate-destroying gas CO<sub>2</sub> which threaten to create a gap between ideals and action in Norwegian environmental policy. Three years ago the prime minister promised that in environmental policy Norway would "be so far advanced in its own initiatives that it would be possible for us to play a real leadership role." The Storting then voted that Norway should stabilize her emissions of CO<sub>2</sub>. A number of other countries have comparable goals. If the "greenhouse" theory is correct, even this goal is clearly not adequate to stop the damage to the climate. But it nevertheless appears that Norway will not even fulfill her own modest goal because many people believe that concern for workplaces comes first.

The excuse which Norway is now in the process of putting together is that it will be cheaper to reduce other countries' emissions. But this excuse is not credible either when Norway fails to implement any of the cheapest [solutions] to limit the growth in CO<sub>2</sub> emissions, viz., by halting the construction of methanol plants and gas power plants in Norway. It is doubtful whether there would be any economic victims at all if we stopped building these sources of new emissions. But in Norway, which speaks affectionately of "cost-effective environmental protection measures," we easily forget our own principles when oil and gas interests come into the picture.

**From Bad to Worse**

Norwegian arguments in favor of these new polluting measures could make the bad worse. It is said that if we do not build such installations, others will do so, and so nothing is gained by stopping. But with arguments like this, every country could indeed defend any polluting establishment whatsoever. And in the next round, when Norway wants to build a gas power plant, it will be built in a place where the waste heat cannot be used rationally. That means that a major share of the energy from a

Norwegian gas power plant would be lost although it is said that we must invest in energy conservation.

According to NATIONEN, Christopher Flavin of the Worldwatch Institute, one of the world's foremost experts on the environment, recently stated that:

"Norway has dropped way down on the list of countries which are leading the search for a more sustainable development. Indeed you even rank behind Great Britain."

The country's leaders ought to take a serious look at the risk Norway runs of abandoning its ideals in the area of environmental protection and undermining its credibility in the eyes of both the world and Norway's voters. Presumably that is not profitable either.

## UNITED KINGDOM

### Employer Protection Against Work-Related Illness Proposed

92WN0331A London THE DAILY TELEGRAPH  
in English 24 Jan 92 p 7

[Article by Kevin Maguire, Labor Correspondent]

[Text] Employers will be obliged to protect staff from illnesses linked to prolonged working on computer screens including eye problems, stress, and Repetitive Strain Injury, under proposals published yesterday by the Health and Safety Commission.

It is estimated they will cost up to L295 million to implement over the next 10 years.

Firms will be required to pay for eye tests and glasses, if needed, provide regular screen breaks and supply appropriate chairs, footrests, desks and lighting.

The proposals also require companies to give staff regular rest breaks although precise requirements are not laid down.

However they do not give pregnant women the right to be removed from screen work. The National Radiological Protection Board says radiation levels from VDUs are so low they pose no risk.

The draft regulations, produced to comply with a EC directive, could become one of the most important industrial safety initiatives of recent years although unions and pressure groups said they were too vague and weak.

The TUC [Trade Union Congress] said that the proposals applied only to "habitual" VDU users and excluded temporary staff.

VDUs are currently covered by the onus on employers to maintain safety under the 1974 Health and Safety at Work Act.

An estimated 6.75 million VDUs are now in use, twice the number of six years ago, and the HSE [Health and Safety Executive] says an average of L42 will have to be spent on each workstation to comply with the proposals.

A rise in health complaints has been linked to the growth in the use of keyboards and some safety experts now fear keyboard-induced RSI could become a major white-collar injury.

Dr. Pamela Buley, a senior official in the HSE's health policy division, said detailed figures on RSI caused by inadequate VDU keyboards were not yet available but last year there were 100,000 "upper limb disorders" reported.

"Back pain and upper-limb disorders are by far and away the most serious occupational health problem around," she said.

Musculoskeletal illnesses have been recognized as industrial injuries since 1948 but they have been often regarded as a blue-collar condition with thousands of manual workers winning compensation for ailments such as cotton twister's cramp, washer woman's arm, and chicken plucker's wrist.

But thousands of compensation claims are now pending from white-collar workers, mainly women, complaining that they have suffered pains in their hands, arms and neck through using electronic keyboards.

British Telecom recently appealed against the award to two former data processing officers of L6,000 each in what is regarded as a legal test case.

Sir John Cullen, chairman of the Health and Safety Commission, said employers would face mountain compensation claims if they failed to follow the proposed regulations.

"The proposals should help employers and display users avoid all these problems. They should avoid the need for large compensation payments and improve comfort at work," said Sir John.

Work with Display Screen Equipment—Proposals for Regulations and Guidance, free from the Sir Robert Jones Memorial Workshops, Units 3 and 5-9, Grain Industrial Estate, Harlow Street, Liverpool L8 4UH.

### High-Grade Uranium Loss Highlights Risks of Use

92WN0333A London THE DAILY TELEGRAPH  
in English 25 Jan 92 p 1

[Article by Christine McGourty, Technology Correspondent]

[Text] Part of the Dounreay nuclear reprocessing plant is to be cleaned out in an attempt to find 3kg (6.6lb) of highly enriched uranium that is still missing after an eight-week search.

A hunt for 11kg of uranium began early last month after a routine inspection revealed a loss. AEA [Atomic Energy Authority] Technology, which owns the plant on the north coast of Scotland, said yesterday that recording errors could account for only 8kg.

The remaining uranium was undoubtedly on the site, a spokesman said. A clean-out operation—the first at Dounreay—would begin in the next few days to find it and was expected to last several weeks.

Uranium is twice as dense as lead and a 3kg lump—about one seventh the quantity required for a nuclear bomb—would be the size of a small apple. But it is diluted in the recovery process and the missing uranium is expected to be liquid.

The AEA Technology spokesman said its volume was impossible to predict because the uranium existed in different dilutions at different stages of the process.

During the clean-out, the cocktail of chemicals in the uranium recovery plant's tanks and pipes will be washed into a tank where it will be sampled.

Of the missing 8kg that has now been tracked down, 3kg was flushed out to sea as liquid waste. A spokesman said the uranium had "very low levels of radioactivity" and was a fraction of the amount the plant is permitted to dispose of annually at sea.

The rest of the 8kg was accounted for as solid waste and other materials.

In its report on the incident, AEA Technology admitted there were "a number of areas where it will be necessary to improve management procedures, accountancy and record keeping".

Mr. Paul Leventhal, of the Nuclear Control Institute in Washington DC, said the incident highlighted the risks of using bomb-grade material in civil programs where accounting procedures were "less than perfect".

Even small amounts made an important contribution to the materials needed for a bomb, he said.

"There's always a margin of error in these clean-out procedures and a skilled worker will know how to exploit these to remove material. The company will never know whether it was lost or deliberately diverted."

### **Water Pollution Cases More Than Double in 1980's**

92WN0332A London THE DAILY TELEGRAPH  
in English 28 Jan 92 p 2

[Article by Colin Randall]

[Text] Cases of water pollution more than double in England and Wales during the 1980s, with sewage spillages and farms responsible for half of them.

A National Rivers Authority report disclosed yesterday that contamination figures had reached record levels as the number of reported incidents rose from 12,600 to 28,100 between 1981 and 1990.

The report appeared to support the NRA's findings a month ago of "real and deteriorating" quality of some rivers. But the authority emphasized the increases—including a 57 percent rise in the Northumbria region between 1988 and 1990—were largely due to the growing public awareness about pollution.

Some 658 of the 1990 incidents were defined as major, or potentially serious enough to wipe out large numbers of fish or cause temporary water closure.

The authority, which reports on all controlled waters including rivers, canals, estuaries, lakes and in-shore coastal waters, said its report presented for the first time a comprehensive analysis of pollution incidents.

Dr. Jan Pentreath, the authority's chief scientist, said: "it is important to note that the majority of reported incidents are of a minor nature and that many are not confirmed when investigating officers visit the scene."

Prosecutions were mounted in all major cases where evidence could be obtained. Problems arose because samples sent to laboratories often took so long to be analyzed it was often too late to collect further samples if the results were inadequate.

The worst-affected regions were Severn Trent (6,081 or 22 percent of all reported cases), North West (4,171, 15 percent) and Thames (3,441, 12 percent). Northumbria remained the lowest, at 1,245 (four percent) even though more incidents were reported.

Overall figures show oil and sewage spillages accounted for 42 percent of the 1990 figures, with farm and industrial sources responsible for 21 percent.

The authority recommended last week that farmers should lose Government grants if they failed to save rivers, streams and fish from contamination by slurry and other waste.

Three of the 10 water regions—North West, Severn Trent and South West—were responsible for 70 percent of the major incidents.

Mr Blake Lee-Harwood, senior water campaigner for Friends of the Earth, said: "Taken together with the earlier report on river quality, this report is a sad reflection on Government policy and the water environment."

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